COAST DAIRIES LONG-TERM RESOURCE PROTECTION AND USE PLAN

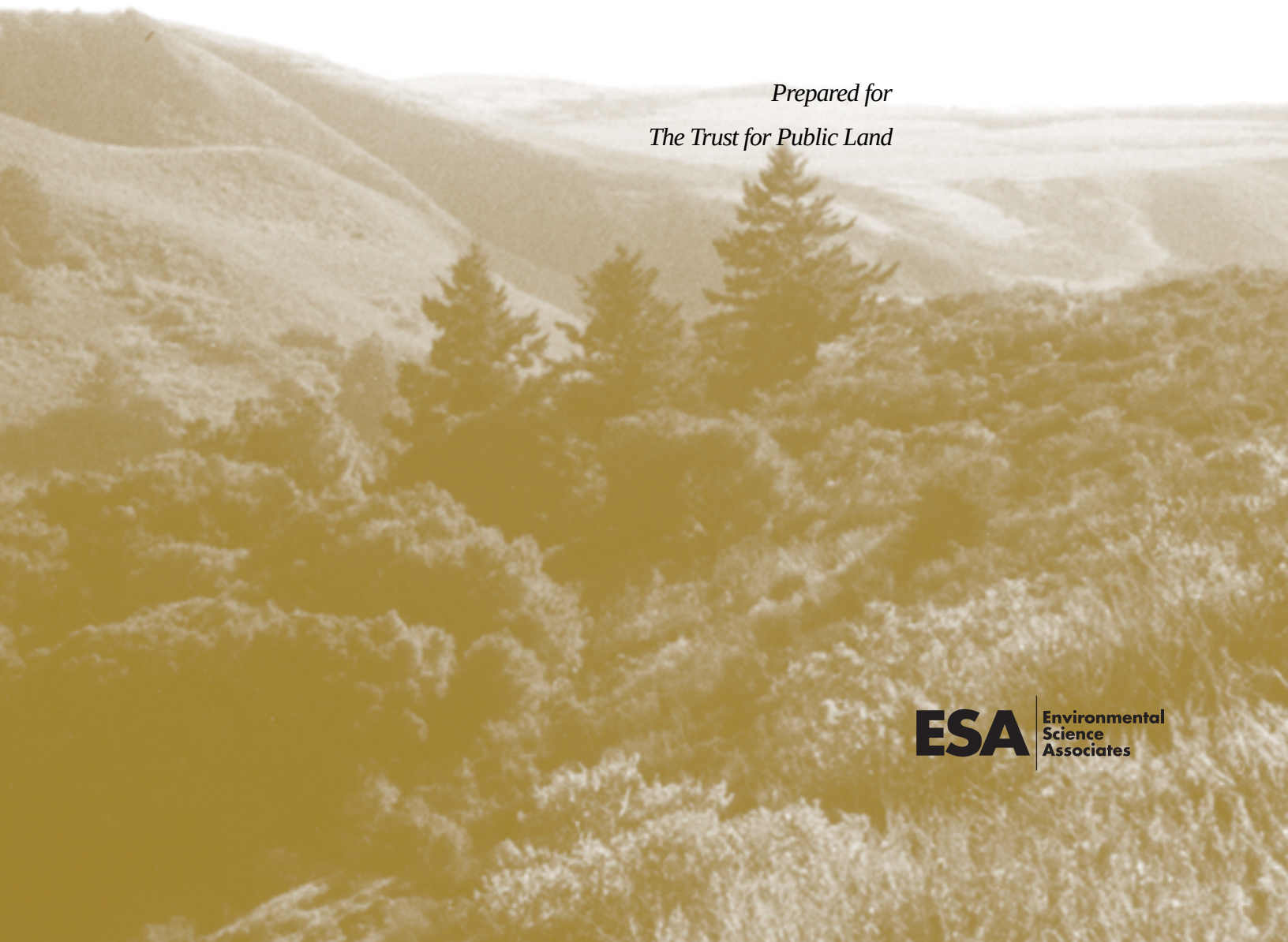
Existing Conditions Report for the Coast Dairies Property

THE TRUST FOR PUBLIC LAND

June 2001

Prepared for

The Trust for Public Land



ESA Environmental Science Associates

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INTRODUCTION

EXISTING CONDITIONS REPORT FOR THE COAST DAIRIES PROPERTY

As described in detail in the following section, the modern history of the Coast Dairies Property began around the turn of the last century. Two Swiss families, the Respinis and the Morettis, formed the Coast Dairies & Land Co. (CDLC) and acquired in its name the lands of two entire Spanish grants, from Scotts Creek in the north to Laguna Creek in the south. The Swiss dairymen put cows on the hillside pasturelands; in 1906 a large cement plant was built at Davenport and supported by a system of quarries, an enterprise which survives today as the RMC Pacific Materials, Inc. (RMC) operation. By the 1920s, the families that owned the Coast Dairies & Land Co. had moved back to Switzerland – they and their heirs continued to lease land to local farmers and dairy operators. The hillsides were extensively logged. By midcentury, better refrigeration and transportation gave dairies east of the mountains competitive advantages, and the coastside dairies closed. In the 1950s, but for the cement plant and a few leased artichoke and Brussels sprouts fields, the stretch of coast from Santa Cruz to Half Moon Bay was more or less as it had been in the early nineteenth century, although in some ways it was less settled, populated and exploited. The redwoods resprouted in the higher canyons; streamsides stabilized. The landscape returned to something like the original mosaic of beach, creek and bluff, dun-colored scrub and deep green woodland, under the Central Coast blend of blue sky and restless fog.

But California was growing rapidly and in the 1960s Santa Cruz was poised to expand north toward Davenport. The absentee landlords were two generations removed from the coast, and selling the Property to a developer was tempting. In the 1970s, Pacific Gas & Electric Company acquired an option on the Property with a view to building a nuclear power plant, until the likelihood of a major earthquake eliminated the site from further consideration. In 1993, the California Coastal Conservancy secured an option on the Property, but when a 1994 statewide parks bond measure failed to pass, the Coast Dairies Property went back on the market.

Given the long list of parkland purchases awaiting funding, there seemed to be less and less chance that any public institution would be able to step forward to protect the land. Federal spending from the Land and Water Conservation Fund to buy parkland and wildlife habitat had dropped nearly 70 percent since 1980. In the same period, state funding for park expansion had fallen about 90 percent. In 1996, a Las Vegas developer held an option on the Coast Dairies Property with a plan to develop it as 139 separate parcels.

In 1997, the Save-the-Redwoods League acquired the option to purchase CDLC. Save-the-Redwoods League then assigned the option to the Trust for Public Land (TPL). The TPL exercised its option in October 1998, purchasing CDLC and its Coast Dairies Property with funds from anonymous donors, the David and Lucille Packard Foundation, the California Coastal Conservancy, the Land Trust of Santa Cruz County, and others. During the purchasing process TPL issued a Request for Proposals to locate an entity to receive the fee ownership of, and assume the long-term management and stewardship responsibilities for, the Property. Based on proposals received, two agencies, the USDI Bureau of Land Management (BLM) and California Department of Parks and Recreation (DPR), were chosen for ultimate ownership and joint stewardship. Upon successful completion of a *Coast Dairies Long-Term Resource Protection and Use Plan*, it is anticipated that fee title of the Property will be transferred and a new joint state and federal park will be established.

The Coast Dairies Long-Term Resource Protection and Use Plan (Plan) will be developed by the Coast Dairies Steering Committee under a Memorandum of Understanding (MOU) signed by BLM, TPL, CDLC and DPR on August 8, 2000, and in consultation with federal, state and local agencies and the interested public. The Steering Committee includes representatives of the Bureau of Land Management, California Department of Parks and Recreation, Trust for Public Land, the Save-the-Redwoods League, the Land Trust of Santa Cruz County and the California Coastal Conservancy. The Steering Committee's work has been guided since its inception by a Community Advisory Group (CAG), representing the largest practicable combination of potential user groups and concerned and knowledgeable individuals, to provide local input and access to information.

In January 2000, the Steering Committee selected Environmental Science Associates (ESA) of San Francisco as the prime consultants to prepare the Plan. ESA had assembled a team of other firms with specialized skills, (water rights, economics, etc.) and shortly after their selection began working on preliminary field assessments for seasonally-constrained biological resources. Members of the Steering Committee (see Table I-1) and the consultant team (see Table I-2) are collectively referred to as the *Planning Team.* Deliberations regarding the scope of work continued through the summer. These involved a variety of technical issues, but concentrated on the integration of additional documents to comply with the National Environmental Policy Act (NEPA) and the California Environmental Quality (CEQA). A final contract was signed on September 29, 2000 and work commenced on the first work product, this Existing Conditions Report (ECR). This report is the first step in the preparation of the Plan, and provides the basic reference document for planners. It also assesses and identifies data gaps and uncertainties in the scientific record for this part of the Central California Coast.

No plan can ever satisfy all its data needs. As a reference, the ECR information will be maintained (and updated) in hard copy and electronic form (through the use of a geographic information system [GIS]) so that it continues to grow and serves as tool for future managers of the land, becoming more accurate and useful as time goes by. The process that links an ECR to the future is called *Adaptive Management.* The ECR is a scientific document, but also serves as

a consensus on what cannot be known before the Plan is completed, but must be known before the plan is fully effective. Adaptive Management describes the kind of studies and surveys which are performed over a longer period of time to help guide commitments of resources and identify appropriate types and levels of land use. The Adaptive Management program for the Coast Dairies will be a major feature of the Plan.

TABLE I-1
MEMBERS OF THE COAST DAIRIES STEERING COMMITTEE

Name	Affiliation	Address
Laura Perry	Executive Director Land Trust of Santa Cruz County	P.O. Box 1287 Santa Cruz, CA 95061
Ruskin Hartley Kate Anderton	Save-the-Redwoods League	114 Sansome Street, Rm 605 San Francisco, CA 94104
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Dave Vincent	District Superintendent California Department of Parks and Recreation	600 Ocean Street Santa Cruz, CA 95060
Rick Hanks .	Hollister Field Office Bureau of Land Management	20 Hamilton Court Hollister, CA 95023
Darcey Rosenblatt	TPL Project Manager	116 New Montgomery Street, Suite 300 San Francisco, CA 94105
Liza Riddle	TPL Director of Projects	116 New Montgomery Street, Suite 300 San Francisco, CA 94105
Edith Pepper	Coast Dairies & Land Co. Project Manager	116 New Montgomery Street, Suite 300 San Francisco, CA 94105

TABLE I-2
MEMBERS OF THE COAST DAIRIES PLANNING TEAM

Name	Address	Phone/Fax/Email	Contact	Role
The Trust for Public Land, Western Region	116 New Montgomery Street, Third Floor San Francisco, CA 94105	Phone: 415-495-5660 Fax: 415-495-0541 darcey.rosenblatt@tpl.org	Darcey Rosenblatt	Planning Team Lead
Environmental Science Associates	225 Bush Street, Suite 1700 San Francisco, CA 94104	Phone: 415-896-5900 Fax: 415-896-0332 troberts@esassoc.com	Tom Roberts	Prime Consultant
Agland Investment Services, Inc.	711 Grand Avenue, #290 San Raphael, CA 94901	Phone: 415-460-1352 Fax: 415-460-5368 wmott@aglandinvest.com	Bill Mott	Subconsultant for Agriculture
Albion Environmental, Inc.	1414 Soquel Avenue, #205 Santa Cruz, CA 95062	Phone: 831-469-9128 Fax: 831-469-9137 cblount@albionenvironmental.com)	Clinton Blount	Subconsultant for Biological and Historical Resources
Dornbusch & Company, Inc.	2907 Claremont Avenue, #120 Berkeley, CA 94705	Phone: 510-841-1750 Fax: 510-841-1751 ddornbusch@ddorn.com	David Dornbusch	Subconsultant for Economics
Ellison, Schneider & Harris	2015 H Street Sacramento, CA 95814-3109	Phone: 916-447-2166 Fax: 916-447-3512 ajs@eslawfirm.com	Anne Schneider	Subconsultant for Water Rights

TABLE I-2 (Continued)
MEMBERS OF THE COAST DAIRIES PLANNING TEAM

Name	Address	Phone/Fax/Email	Contact	Role
Pacific Meridian Resources	5915 Hollis Street, Building B Emeryville, CA 94608	Phone: 510-654-6980 Fax: 510-654-5774 chendrix@pacificmeridian.com)	Chad Hendrix	Geographic Information Systems
Rana Creek Habitat Restoration	35351 East Carmel Valley Road Carmel Valley, CA 93924	Phone: 831-659-3820 Fax: 831-659-4851 ranacreek@earthlink.net	Paul Kephart	Restoration; RMC Liaison
Royston Hanamoto Alley & Abey ASLA	225 Miller Avenue Mill Valley, CA 94941	Phone: 415-383-7900 Fax: 415-383-1433 cordy@rhaa.com	Cordy Hill	Land Use and Recreation
Toyon Environmental Consultants	40 Quisisana Drive Kentfield, CA 94904	Phone: 415-456-5052 Fax: 415-456-4992 toyon@hooked.net	Sandy Guldman	Regulatory Issues
Center for Natural Lands Management	425 E. Alvarado Street, Suite H Fallbrook, CA 92028-2960	Phone: 760-731-7790 Fax: 760-731-7791 cnlm@cnlm.org	Sherry Teresa	Quality Control for Conservation Planning
Alfred Heller Professor of Agroecology Environmental Studies	University of California at Santa Cruz Santa Cruz, CA 95064	Phone: 831-459-4051 Fax: 831-459-2867 **gliess@zzyx.ucsc.edu**	Dr. Stephen Gliessman	Quality Control for Agricultural Planning

This ECR is organized to begin with the land-use "story" of the Coast Dairies Property, essentially the setting for all the data gathered expressly for the Plan. For example, a stream dammed for a half century may look natural a half century after a dam is removed, but the knowledge that the dam was there may illuminate water quality and fisheries information gathered in the two-year period covered by the ECR field studies.

This historical section is followed by sections describing the overall report methodology (including a review of existing information), natural resources; current human uses (including agriculture, mining and recreation); archaeological resources; economics; and local, state and federal regulation of the Coast Dairies Property. Each section contains its own references, describes unique aspects of its own methodology and concludes with an assessment of issues identified for the subject under discussion. In many cases large data sets or, in the case of the land use history lengthy transcripts of interviews, are contained in the project archives to make the ECR text more readable. Tables and simple graphics are integrated with the text, but larger format maps generated by GIS are included and referenced as "attachments."

In all that follows, the Planning Team adheres to the Coast Dairies Mission Statement:

> *It is the purpose of the Coast Dairies Steering Committee to protect and preserve in perpetuity those intrinsic natural and pastoral qualities that make this 7,000-acre± coastal area important to the people of the region, the local community, the state, and the nation.*
>
> *Sound long-term stewardship of this land will be achieved through cost-effective, adaptive management of the property designed to conserve and enhance its biological, open space and agricultural values, restore wetland, riparian, native grassland, forested and other sensitive habitats, and provide compatible recreation.*
>
> *Adaptive management – continual monitoring of the property's resources as the basis for decisions related to the land's use – will allow for responsive stewardship of the natural and economic resources of the property. It will also create valuable opportunities for education in the field of integrating traditional economic and recreational activities, including sustainable coastal agriculture, with programs designed to protect native biodiversity and other natural landscape values.*

SECTION 1.0
COAST DAIRIES: A LAND USE HISTORY

1.1 PREHISTORY

1.1.1 PHYSIOGRAPHY

The physical geography of the northern Santa Cruz coast—the North Coast, in local parlance—is marked by broad marine terraces that rise eastward from the ocean to the Santa Cruz Mountains. These terraces comprise two rock formations, including the Santa Cruz Mudstone Formation (a soft, eroding bedrock) and the Monterey Formation, a hard silica-rich deposit containing Monterey chert, an important source of toolstone for the Native Americans of the Central Coast.[1]

These terraces have been exposed to continuous wave action, resulting in the formation of the distinctive steep cliffs that stand sentinel along the coastline. Sandy "pocket" beaches occur intermittently where streams have cut through the marine terrace to meet the sea, and are often paired with the small estuaries formed by some of the larger streams such as Scott and Waddell Creeks.

The modern climate of the region is considered to be Mediterranean and is characterized by relatively dry summers and moist winters. Average annual rainfall is 27 inches and mean annual temperature is 59 degrees. In the summer months, seasonal upwelling of cold ocean waters generates morning coastal fog. On-shore north or northwesterly winds usually increase during the day, clearing off the fog, and die down again by evening when the fog returns.

Paleoenvironmental studies suggest that climatic conditions 30,000 to 5,000 years ago were slightly cooler and more moist than today. Pollen studies indicate that the climate was more like present day Fort Bragg in Northern California (Jones and Hildebrandt, 1990). Current conditions appear to have been in place by 5,000 years ago.

[1] The term "Central Coast" applies to the region between San Francisco and San Luis Obispo. In this report, the local term "North Coast" applies to the Coast Dairies Property before it was subject to historic boundaries, and may include areas from Point Año Nuevo to the modern day City of Santa Cruz.

1.1.2 TERRESTRIAL ENVIRONMENT AND RESOURCES

The Coast Dairies Property incorporates four major ecological zones[2] including coastal terrace, ridge system, riverine, and upland meadow (Hylkema, 1991). Modern vegetation was most likely present for many centuries before recorded history, and its diversity provided early inhabitants an array of plants and trees for food, medicine, tools and baskets.

For the first human inhabitants of the Property, there was a variety of natural resources that might have been the envy of more interior peoples. Plants bearing edible seeds and/or leafy greens are known to have been used throughout the year, as revealed by plant remains from archaeological sites. In the spring, lupine[3] was harvested for its edible green leaves, while chia provided edible seeds. During the late spring and summer a variety of seed-bearing plants were gathered including tarweed, goosefoot and elderberry. Soaproot was particularly important as it was used for food (edible root), fish poison, soap, and brushes (Fitzgerald and Ruby, 1997). Numerous species of trees and shrubs were also a source of edible nuts and berries including baynut, hazelnut, and tan oak, all of which were harvested in the fall (Fitzgerald and Ruby, 1997). Buckeye, California bay laurel, and coast live oaks are also considered to have been economically important (Hylkema, 1991).

Acorns and grass seeds constituted a significant proportion of the native diet. Ethnographic accounts indicate that the natives sought to increase seed production of coast grasslands through intentional burning. Rediscovered as "prescribed burning" in modern times, this prehistoric practice also served to increase forage and attract large mammals such as black tailed deer, which were regularly hunted (Jones and Hildebrandt, 1990). Other animals in the aboriginal larder came from the coastal scrubland and forests of the area, habitats for terrestrial mammals, reptiles, fish, and amphibians. Oak woodlands in particular harbor a large number of animals and birds for thermal cover, escape, dens, nests, and foraging (Barrett, 1980). Modern and historic use of the region has altered somewhat the ecology of the Central Coast and reconstruction of prehistoric conditions is at least partly by inferrence, but species known to have been important to native peoples include a wide variety of small to medium mammals including the jackrabbit, cottontail rabbit, kangaroo rat, ground squirrel and badger.

Studies have identified more than two hundred resident species of birds in the region but, perhaps more importantly, the cold and nutrient-rich waters immediately offshore lie astride the Pacific migratory waterfowl flyway. Avifaunal remains from archaeological sites on the Santa Cruz coast indicate that waterbirds such as canvasback duck, common merganser and blue winged teal were part of the prehistoric diet (Dietz et al., 1988).

2 Other classification systems, based on alternate vegetation or geological associations for example, will be used in subsequent sections.

3 Plant and animal lists, with scientific names, are included in Section 3.0.

1.1.3 MARINE RESOURCES

Offshore vegetal resources such as kelp, seaweed and sea palm are known to have been exploited prehistorically. Native peoples collected these plants on-shore and roasted them for immediate consumption or dried and stored them for future use (Jones and Hildebrandt, 1990). Shell refuse from an extensive menu of mussels, barnacles, limpets, chitons, abalone and clams are commonly found in coastal archaeological sites. Migratory marine mammals known historically on the Central Coast were probably present prehistorically, and no doubt harbor seals, northern elephant seals, and sea lions were sources of protein and fat. These species were attracted by the same fish exploited by humans: Pacific mackerel, night smelt, white croaker, righteyed and lefteyed flounder and anchovy (Jones and Hildebrandt, 1990).

1.1.4 ARCHAEOLOGICAL RESEARCH

The coastal region stretching from Santa Cruz to San Francisco has been the focus of numerous archaeological surveys and excavations since the early 1900s. The earliest of these investigations reflected the trophy-hunting mentality of the times, collecting museum specimens for display purposes from some of the largest prehistoric residential sites elsewhere in the San Francisco Bay region. These studies were extremely limited in scope and provided little understanding of prehistoric life-ways of people who inhabited this part of the Central Coast.

Beginning in late 1960s, academic research by students at San Francisco State University (and later San Jose State University) expanded the number of recorded archaeological sites along the coasts of San Mateo and Santa Cruz counties. While much of this research was limited to site recording and limited sampling, a few important studies provided valuable information for the development of a regional chronology and an integrated understanding of prehistoric life (Roop, 1976; Hylkema, 1991). Hylkema's 1991 thesis was particularity important, as it not only provided the first integrated examination of prehistoric adaptations along the San Mateo-Santa Cruz coast, but it also provided the basis for comparisons of local economies with those of surrounding areas including the San Francisco Bay, Monterey Bay and inland valleys.

Finally, studies driven by the requirements of the California Environmental Quality Act (CEQA) since the 1980s have also supplied invaluable chronological information, filling the gaps in archaeological data amassed from this part of the North Coast since the early 1900s (Jones and Hildebrandt, 1990; Fitzgerald and Ruby, 1997).

1.1.5 HUMAN OCCUPATION ALONG THE NORTH COAST

Archaeological and ethnographic studies indicate that the North Coast was possibly occupied from as early as the 10,000 years ago. The earliest evidence for occupation of the region comes from a site located in the Santa Cruz Mountains near Scotts Valley. This deeply buried site has been dated to 8000 BC and is the only evidence of what archaeologists refer to as the Paleo Indian period (Cartier, 1993), a designation that subsumes all occupations dating earlier than 5000 BC. Progressively rising sea levels documented for this period may have obliterated

additional evidence for occupation of the coast during this time. As with the climate, sea levels appear to have stabilized to current conditions by 5000 years ago.

Evidence of habitation along the coast proper comes later, during the Lower Archaic period (3000-5000 BC) and from a site immediately adjacent to the Coast Dairies Property at Sand Hill Bluff (Jones and Hildebrandt, 1990). This locale appears to have been occupied over a span of time difficult for modern Californians to comprehend: 5000 years, beginning about 6000 years ago. Habitation of both the coastal and interior regions in and surrounding the Property is evidenced in numerous sites dating to the Middle Archaic (3000 - 1000 BC) and Upper Archaic (1000 BC – AD 1000). The latest prehistoric occupation appears to have occurred during what is known as the Emergent Period (AD 1000 - 1800) as evidenced at a site located at Davenport Landing (Fitzgerald and Ruby, 1997), and at a site about 5 miles inland in the Santa Cruz Mountains (Hylkena, 1991). Native inhabitants of the region were first encountered by Spanish explorers in 1602 and again between 1769 and 1776. Aboriginal groups of the San Francisco and Monterey Bay area came to be known collectively as Costanoan, a word derived from the Spanish word *Costaños* meaning 'coast people' (Levy, 1978).

During the mission period, AD 1770-1835, devastating changes occurred for the Costanoan people. The population was recruited into nearby missions and their traditional subsistence economy was replaced by an agricultural one. Analyses of mission baptismal records demonstrate that the last Costanoan tribelets living a traditional existence had disappeared by 1810 (Levy, 1978). As was true in much of the Americas, the population experienced a dramatic decline due to the introduction of European diseases, which consequently caused lower birth rates. And in a further blow, the mission culture that had absorbed and to some degree supported the Costanoans was short-lived. The secularization or abandonment of the missions by the Mexican government in 1832 caused people to relocate to different areas and establish small settlements, fragmenting the survivors and separating them farther away from their cultural heritage. It is believed that the Costanoan languages were probably not spoken after the year 1935 (Levy, 1978).

Most of what we know about native inhabitants of the region has been pieced together from the Spanish exploring expeditions, ethnographic accounts in the 1920s and 1930s (Krober, 1925), and archaeological research. The Costanoan territory was occupied by approximately 50 separate triblets, each one occupying one or more permanent village sites. The Coast Dairies Property is located within the boundaries of the area inhabited by the *Cotoni* tribe, which occupied the land from the mouth of the San Lorenzo River, north to Año Nuevo Creek, and east as far as Bonny Doon Ridge (Milliken, 1995).

The Costanoans encountered by the Spanish were hunter-gatherers who managed their resources to ensure a sustained livelihood. They lived in sedentary communities in domed structures covered with thatched roofs, and relied for subsistence on nuts and seeds from various trees and plants, local fauna, and fish, particularly salmon[4], from the rivers and Pacific Ocean. Materials

[4] Curiously, a cursory examination of fish remains from sites in and around the Coast Dairies properties reveals only a single steelhead trout element from a site at Davenport Landing (Fitzgerald and Ruby, 1997).

crafted by the Costanoans and used in subsistence activities included baskets, mortars, pestles, nets, net sinkers, anchors, and a variety of chipped stone tools. Trade with the surrounding Plains Miwok, Sierra Miwok and Yokuts allowed nonindigenous materials and food (i.e. piñon nuts) to be brought into the area as well. In exchange, the Costanoan are thought to have exported bows, salt, and salmon to neighboring groups (Levy, 1979). Economic reciprocity, in addition to intermarriage, is thought to have linked settlements together, some of which, by Spanish accounts, indicate stable and prosperous villages with as many as 200 people (Milliken, 1995). Overall population density along this part of the coast was nevertheless very sparse.

Archaeological research has helped us to understand what life was like prior to European contact, in at least some of its complexity and richness. For example, examination of numerous sites along the coast, adjacent terraces, and ridge systems of northern Santa Cruz County indicates that prehistoric inhabitants made use of a range of ecological zones including coast terrace, ridge system, riverine, and upland meadows, and that native inhabitants moved between these ecological zones to support a diverse human ecology. In what is referred to as a forager economic strategy, groups of people move from one location to another exploiting the resources in the immediate vicinity. Using their settlements as a base of operations, group movements were on a seasonal basis to optimize resource harvesting. It has been hypothesized that this strategy is extremely efficient in an ecological context like northern Santa Cruz County where resources are relatively dispersed, or not concentrated in one area. The distribution of marine and terrestrial mammals within a mosaic pattern of the coastal terraces and mixed hardwood forests are thought to have encouraged a foraging strategy until very late in time, possibly up until contact with Spanish explorers.

1.2 A HUMANIZED LANDSCAPE

Most discussions about Santa Cruz County's North Coast emphasize the scenic natural beauty of the coastline, and indeed many aspects of today's scenery have evoked the same reactions for many generations of residents and visitors. Yet, as we begin to review the historic period, we find a landscape heavily altered by long and often intensive human use. On the Coast Dairies Property, sunsets are viewed while standing on massive structures, now unrecognizable as railroad trestles, looking across fields of Brussels sprouts, to a western edge broken by the towers of the cement plant. Streams have been dammed, diverted through tunnels, flumed and in several instances encased in pipes and carried away to serve the citizens of Santa Cruz. Road cuts and fills slice the landscape, and everywhere one can see concrete abutments, truncated water pipes and bolts protruding from the earth, monuments to an industrial (or at least an entrepreneurial) past.

This section of the Existing Conditions Report is an effort to bring the human story to the forefront, to highlight the remarkable ingenuity and energy that came to the North Coast and tried to transform it—to put the human communities that lived or migrated here into the ever-changing landscape beside the animals, plants, and the physical environment.

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The story of the North Coast is really two histories, before and after the incorporation of the Coast Dairies & Land Co. in 1901. The combination of the Moretti and Respini family assets, together with the leadership of Louis Moretti, provided a catalyst for an explosion of activity more like the booms of the gold fields or Silicon Valley than the pastoral landscape we value today. The Coast Dairies Corporation was the major agent for change in the early twentieth century. The over-arching theme of both is that of a treasure trove of natural resources locked up and isolated by a formidably rugged landscape. Many who came to the North Coast marveled at its potential—the forests, limestone, bitumin, fresh water, rolling grasslands, terraces—all ripe for utilization, and then added "if only we had…" followed at different times by the phrase "dependable road," "protected harbor," "railroad," "straight highway," or even "freeway." The North Coast is dominated by the long, narrow coastal terrace perched a hundred feet or so above the ocean, offering little access when approaching by sea, while the rugged and irregular Santa Cruz Mountains provide a parallel barrier on the east. The northern end of the terrace was blocked by a mudstone bluff that comes down to the ocean's edge just north of Waddell Creek, which forced early travelers into the surf to get past. The only easy access to this terrace is from the southeast, but its length is so dissected by gullies and valleys that, until the coming of the railroad in 1905, it was extremely difficult to traverse. "*The road to Pescadero is thirty-six miles in length, follows along the coast, and is one of continuous ups and downs*," wrote one observer in 1880. "*It would be a slander to say it is a comfortable road over which to ride." (Sentinel* 1/31/1880).

The natural landscape blunted the forces of development and forced them into slow motion, creating a thirty-year lag compared to areas north or south. While the railroad connection between Santa Cruz and the outside world was completed in 1876, the North Coast wasn't connected until 1906; likewise, the big sawmills came to the redwood canyons on the east side of Ben Lomond Mountain in the 1880s, but didn't reach the North Coast until 1909.

The North Coast's isolation became an asset when harried citizens from the San Francisco Bay Area sought relief in the sheltered campgrounds that grew up at every stream crossing. The "*secret recesses and wildest haunts*" lured fishermen, hunters and campers away from the "*comparatively bleak valley of Santa Clara*." (*Sentinel* 5/18/1872)

Finally, and fortunately for the future of the Coast Dairies Property, some developments never came at all. The coastal subdivision frenzy of the 1920s that saw the entire coastline from Santa Cruz to Aptos divided and sold into houselots was slowed enough that, when it finally arrived in the late 1960s, the community rose up and stopped it.

A Landscape for Everyone

There are a multitude of landforms compressed between the surf and the top of Ben Lomond Mountain. Rainfall amounts double in that distance and a mere turn in a canyon can change the visitor's experience from bright, open landscape to deep, redwood forest. The North Coast offered something for everybody; most immigrants could find a familiar niche within which to live and work. And for some, like the Swiss, for whom the coastal hills evoked Switzerland's

Canton Ticino, that was an impetus to settle. Azorean whalers worked from Pigeon Point, Japanese farmers tilled the coastal terraces, Chinese abalone hunters prowled the rocks, Swiss and Portuguese dairymen tended their herds, Filipino and Mexican farm laborers worked under the sun, and Italian farmers coaxed the land to grow artichokes and Brussels sprouts. Greek stonecutters risked their lives quarrying a living out of the San Vicente Canyon.

1.2.1 THE VIEW FROM THE SEA

Juan Rodriguez Cabrillo, November 1542

Cabrillo's account includes a brief mention of the North Coast including the fact that they saw "*neither Native Americans nor smokes*[5]*"* (Wagner, 1929). Cabrillo's emphasis that trees came right down to the water at other locations (Point Reyes, Point Pinos) suggests that the coastal terrace near present-day Año Nuevo had few if any trees.

Sebastian Cermeño, December 1595

In December 1595, Spanish explorer Sebastian Cermeño sailed southward along the coastline in a makeshift canoe. He was much more definite about the appearance of the land: "*In going along very close to land, frequently only a musket-shot from it, all that may be seen is bare land near the sea and pine and oak timber in the high country. No smokes or fires appeared*." (Wagner, 1929)

Francisco de Bolaños, 1603

Spanish pilot Francisco de Bolaños was with Cermeño and returned with Captain Sebastian Vizcaíno in the 1603 passage that was the occasion to name Año Nuevo. Bolaños wrote the description that would be the guide for all Spanish ship captains for the next 150 years. His description of the coastline south of Point Reyes: *"From the Punta de los Reyes about fourteen leagues*[6] *southeast a quarter south there is a point* [probably Pigeon Point]. *Before reaching it the country consists in places of sierra, bare to the sea and of medium height with some cliffs, but soon the country inside* [inland] *becomes massive and wooded until you reach a point of low land in 37 ½ degrees named the 'Punta de Año Neuvo."* To emphasis the distinctiveness of Point Pinos on the south side of Monterey Bay, Bolaños noted that the forests there covered the land "*down to the sea itself*." (Wagner, 1929)

Archibald Menzies, November 1792

One later account further confirms the view from the sea. In November, 1792 English scientist Archibald Menzies described the coastline south of San Francisco: "*In the afternoon we coasted along shore to the Southward* [from San Francisco] *with a fresh breeze, the land appearing much the same as to the Northward of Port San Francisco naked & hilly, with here & there perpendicular cliffs of a whitish appearance facing the Sea."* (Menzies, 1792) Since the Mission

5 Presumably, this is a reference to manmade fires.
6 A Spanish league was approximately 2.6 miles.

Santa Cruz had just been established (1791), the North Coast's barren appearance can not be attributed to grazing by mission livestock, and reflects instead the natural factors discussed in Section 3.0.

1.2.2 THE VIEW FROM THE LAND

The first Europeans to pass along the North Coast on land were Spaniards, members of the expedition sent northward from San Diego in 1769 to find the port of Monterey described by Vizcaíno in 1603. They passed along the North Coast twice.

The Portolá Expedition 1769

Led by Captain Gaspar de Portolá, the expedition became confused by the topography around the Monterey Peninsula and continued northward along the coast, looking for the right combination of harbor and pine trees coming "*down to the sea itself."* Recognizing neither, they continued northward, passing the San Lorenzo River on October 18.

Marching along a mesa approximately three miles wide, they encountered a "toilsome" landscape: "*We traveled three hours and a half but only made two leagues during which we descended and ascended four deep watercourses carrying running water which empties into the sea. Only in the watercourses are any trees to be seen; elsewhere we saw nothing but grass, and that was burned*." (Bolton, 1966) Since they were looking for a shoreline pine forest and expecting to see many Native Americans as Vizcaíno had, the empty bare hills in the east were very disappointing. On October 19, Engineer Miguel Costansó wrote: "*To our right there were some whitish, barren hills that filled us with sadness, and there were days on which we missed the comfort of seeing natives."* (Browning, 1992)

But it was the rugged terrace and the seemingly unending sequence of arroyos that made the Spaniards most disconsolate. Father Crespí, the Church's representative on this journey, noted that "*this march was very troublesome, on account of the frequent gulches along the way, for we crossed seven, and they caused a great deal of work in making them passable*." (Bolton, 1966) Their mules slipping and falling in the steep-sided arroyos, the Spaniards struggled ever northward along the terrace, finally camping at the mouth of present-day Waddell Creek on October 20. While at this campsite the expedition experienced a startling recovery from an earlier outbreak of scurvy[7], before slipping past the bluffs to the north and out onto the terrace behind Año Nuevo. Portolá's confusion increased when they saw San Francisco Bay; as winter deepened, they headed back southward along the coast.

Since the stream-crossings were still in place, the expedition traversed the North Coast terrace in less than half the time it had taken them going northward. On November 21 they camped at the mouth of present-day Majors Creek, and Father Crespí noted the abundance of geese: "*On this and the preceding days the soldiers killed a great many geese, the flocks of these birds that are*

[7] The Spaniards considered their recovery a miracle, but present-day botanists suggest that the scurvy might have been alleviated by their eating food containing large amounts of Vitamin C, perhaps either food given to them by the Native Americans, or blackberries and rose hips. See Browning, 1992, p. 113, note.

seen at every step being uncountable. Some of the soldiers' messes have twelve of them saved up. Blessed by the Divine Providence which relieves us in our direst need!" (Bolton, 1966)

Eventually, after returning to San Diego and then marching back up to Monterey Bay, they recognized the harbor and found the pine trees "*down to the sea itself."* In June of 1770 the Spaniards established the capitol of Alta California at Monterey. The North Coast had been a diversion both worrisome and restorative.

The Third and Last Spanish Passage Along the North Coast – The Rivera Expedition 1774

The Spaniards made the journey from Monterey to San Francisco Bay several times, but their memory of the difficulty of traveling along the coastal terrace encouraged them to follow the route through the more level inland valleys, along the route of present day Highway 101. Over the intervening five years their North Coast stream crossings washed out and vegetation grew up to obscure the trail.

In December 1774, the Spaniards made their last journey of exploration along the North Coast. After exploring San Francisco Bay, the expedition crossed over the ridge of the Santa Cruz Mountains and paralleled the North Coast. The trip's two diarists, Captain Don Fernando Rivera and Padre Francisco Paloú left very detailed accounts. After waiting for low tide and making a dash across the sand at the base of the bluff at present-day Waddell, they followed the coastal terrace southward through land of "*pure earth covered with grass*." Though they saw few Native Americans during their passage, Paloú noted their presence: "*…at every step we have come upon paths well beaten by* [the Native Americans] *which descend from the mountains to the shore*." The constant crossing of arroyos was tiresome, and in some instances they were "*so precipitous that we were all compelled to go on foot*." (Bolton, 1966)

The 1774 trip decided the matter. The North Coast was not to be the route when going from Monterey to San Francisco, and in 1775 Spanish Lieutenant Pedro Fages officially recognized the inland passage from Monterey to Mission Santa Clara and San Francisco. He called it a "short cut" that "*traverses more passable ground* [than the coast], *and saves a matter of ten leagues of distance*." (Priestly, 1937)

The die was cast. The primary Spanish north-south route through Central California (later called the El Camino Real) did not come along the "tiresome" North Coast. The land that came to be known as Santa Cruz County's North Coast and ultimately the Coast Dairies Property remained isolated, rugged and forbidding.

1.2.3 THE SPANISH COLONIAL ERA (1770-1822)

Because the North Coast was off the beaten path and remote relative to the other mission establishments at Carmel and Santa Clara, the North Coast was not actively settled until 17 years after Lieutenant Fages made his travel recommendation.

Mission Santa Cruz, established 1791

The establishment of the Mission Santa Cruz beside the San Lorenzo River in August of 1791 marked the beginning of Spanish occupation of the North Coast. In its early years the mission looked eastward across the coastal terrace for its pasturage, but following the establishment of the Villa de Branciforte[8] on that terrace in 1797, the padres turned their attention to the North Coast.

North Coast Controlled by Mission Santa Cruz

Mission Santa Cruz eventually came to control a swath of the North Coast extending 11 leagues (28.6 miles) with a width of three leagues (7.8 miles) inland from the coast. The land was used to pasture mission livestock including cattle, sheep and horses. Three ranchos[9] are mentioned in the mission records: *El Matadero* which evolved into the Mexican-era Refugio grant located south and east of Laguna Creek; *El Jarro* which evolved into the Agua Puerca y las Trancas grant, centered on present-day Scotts Creek; and *Rancho Punta de Ano Nuevo*, centered on Ano Neuvo itself. Rancho El Jarro was mentioned in the Santa Cruz Mission inventory in 1835 as having 2,900 head of sheep (Kimbro, 1985).

The French Spy – February 1827

When M. Duhaut-Cilly's accounts of his visit to California in 1827-1828 were published, they were so detailed and vivid it was assumed by some that he was actually spying for France. Whatever his purpose his accounts are remarkable and would have served well as a military reconnaissance, albeit with a stylish French flair. Sailing south from San Francisco along the coast:

"There are eighteen leagues from the entrance to San Francisco Bay to the roadstead at Santa Cruz, and the way is south-southeast, without turns and dangers. All day we had spy-glasses in our hands to examine the coast, whose aspect the swift progress of the ship altered every minute. In general it is very high in the interior, and everywhere covered with forests of fir trees; it then grows lower by a gentle slope toward the shore; but before reaching it, it rises again to form a long ridge of hills, whence it descends finally to the sea, now bathing the foot of vertical rocky cliffs, now gliding in sheets of foam over sandy or pebbly beaches. Beautiful verdure clothed the plains and hills, where we constantly saw immense herds of cows, sheep and horses. Those belonging to Santa Cruz meet those, less numerous of San Francisco; so that this long strip of eighteen leagues is but one continual pasture." (Carter, 1940)

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8 The Villa de Branciforte was one of three civilian (hence "villa" as opposed to mission) settlements established by the Spanish in Alta California, the other two being San José and Los Angeles. Located on the coastal terrace across the San Lorenzo River from Mission Santa Cruz, the town never received the support it needed from the Spanish government.

9 During the Spanish era, ranchos were lands used by the missions as pasturage for their herds. The boundaries of these tracts of land were generally vague and ill-defined. Later, during the Mexican era, the word rancho came to mean a clearly defined tract of land owned by a private individual.

1.2.4 THE MEXICAN ERA (1822-1848)

Following Mexico's gaining independence from Spain in 1821, Mexican citizens were allowed and even encouraged to apply for land grants on the lands formerly controlled by the missions. However, while Mexican citizens quickly applied for grants in easily-accessible coastal terraces to the east of Santa Cruz, they were slower to move up to the North Coast. By the 1840s there were three Mexican ranchos on the North Coast (Figure 1-1). The effect of the North Coast's isolation can be noted in the fact that the wide, well-watered valley we now call Waddell was not requested as a land grant. Getting to the coastal terrace was just too daunting, even when the land was free.

Rancho Arroyo de la Laguna

This one square league (4,418 acre) rancho was granted to Gil Sanchez in 1840, bounded by Rancho Refugio on the east and Rancho San Vicente on the west. Little is known about Sanchez or his occupation. We can assume that, like the adjacent ranchos, the rancho was used to raise cattle for the hide and tallow trade. The land quickly passed out of Californio (Mexican citizen) ownership in the early 1850s when it was aquired by the Williams brothers. Most of this property was eventually acquired by Jeremiah Respini and became part of the Coast Dairies Property (Clark, 1986).

Rancho San Vicente

This huge grant was originally made to Antonio Rodriquez in 1839, but was regranted to Blas Escamilla in 1846. Since it was laid out after the two neighboring ranchos, the shape has the look of being shoehorned into place between them. The ideal Mexican grant had a proportion of one part cultivatable land, six parts pasture and four parts brush or forest. In those instances where the cultivatable land or pasturage was limited, the grantee was often compensated by being given a greater proportion of brushland or forest. Rancho San Vicente reflects the feeling in Mexican California that brush and forest lands had little value: the cow was king, and by this point in time, livestock had been grazing the terraces for almost 60 years (Clark, 1986).

Rancho Agua Puerca y las Trancas

Bordered on the south by the Rancho San Vicente and the north by Arroyo las Trancas, this 4,422-acre grant went through a series of re-grants until it was finally given to Ramón Rodriguez and Francisco Alviso in 1843. The boundaries wrap around the coastal hills that separate Scotts Creek from the coast, reflecting the desirability of the open pasture land for Mexican Californians (Clark, 1986).

Figure 1-1
North Coast Ranchos

No communities grew up on or near the three land grants, and access to them was such that they do not play a central role in the history of Central California. Just as during the Mission Era, the land was used as pasture, with herds of cattle and sheep grazing across the coastal terrace. Hides and tallow were probably shipped off coastal landings. There is no evidence of any other economic activity on the North Coast prior to 1850.

In 1849, Justo Veytia, a Mexican citizen, set out on horseback for San Francisco via the North Coast. Neither of the local residents (both born near Santa Cruz) accompanying him had ever taken this route before, a testimony to the fact that in the 1840s the route of choice was either over the summit of the Santa Cruz Mountains directly north of Santa Cruz, or out through the Pajaro River gap and then north up the Santa Clara Valley. Passing the bluff at present-day Waddell:

"Two days of this expedition were the most difficult. The second day on the road one has to travel along the beach very close to the water and this can only be done when the tide is low. The day we passed the sea was quite choppy. Neither Arana nor I knew the road so when we went onto the beach we figured it was all right because when a very big wave came up, it only reached the horses' hooves. So we rode on about 300 varas[10], experiencing two very bad spots because of some rocks, when the very rough sea began to wash over us up to the pommel of our saddles. We didn't deliberate in making a decision—to go back was clearly dangerous because the rocks were now under water and we couldn't see the openings between them so we resolved to continue forward to look for some pass where we could go up, for the waves had us pinned against a fairly high cliff. We went on walking for about 200 varas until we found a foot path to ascend and as soon as we were safe we undressed completely to put our clothes to dry because the waves had knocked us down three times, horses and all, so we had to dismount and pull them forcibly. We got out at ten in the morning and as soon as we finished stretching out our clothing and the saddles, we sat down naked on the grass to lunch on the supplies we brought which were now also soup." (Veytia, 1975)

1.2.5 STATEHOOD (1850 – 1900)

The first 50 years of statehood witnessed continued slow and fitful development on the North Coast. Settlers struggled up the coast periodically and tried to carve out their livings, but the isolation made it extremely difficult. Nevertheless, the years immediately following the Gold Rush saw a surge of activity during which any locale which could produce and ship anything useful was brought into the economy. Products were shipped off the "landings." Without a dependable road connection in any direction, the residents of the North Coast had to transfer goods in and out across several stretches of beach, where in fact no ship could actually land, at the mouths of the coastal creeks. These coastal facilities were quite different than those to the east of Santa Cruz, within the relatively sheltered confines of Monterey Bay: the North Coast landings were exposed to the power of the open ocean. Wharves along the North Coast rarely

[10] A Spanish vara was 33 inches.

survived through one winter season, and most shipping was handled using combinations of buoys, winches and cables.

The landings operated with the ebb and flow of economic as well as natural tides. When the prices of commodities were high, such as in the early 1850s when San Francisco began to emerge from the sand dunes and gold dust flowed into that city from the Sierra Nevada, few expenses were spared to operate the North Coast landings. When prices dropped, the landings grew quiet, as during the depression of the mid-1870s when most of them ceased to operate. The North Coast continued to be a wild, rugged, and unforgiving place.

The Shape of Santa Cruz County

When Santa Cruz County was officially established on February 18, 1850, its northern boundary was the headwaters of San Francisquito Creek, many miles north of the troublesome bluff at Waddell. The county included the watersheds of Pescadero Creek and San Gregorio Creek as well as the settlements that had grown up there, such as the town of Pescadero.

The County Road between Pescadero and Santa Cruz

For the North Coast, having county neighbors to the north meant that they were *on the way to somewhere*. As long as Año Nuevo, Pigeon Point, Pescadero and San Gregorio were part of Santa Cruz County, efforts and resources might be expended to improve the run-it-at-low-tide situation at Waddell. Those who lived in Pescadero and wished to use the legal services at the county seat of Santa Cruz were 40 miles of bad road away.

The State of the Road in 1865

An article written in 1865 declared that the county road was a "*great hardship and injustice to the people living at Pescadero and its vicinity.*" The writer described it as "*one of the most abominable roads this side of Kamchatka—a road, a portion of the distance must be traveled along the beach which is encompassed by a high bluff upon one side and the foaming billows upon the other…*" (*Pajaro Times* 1/20/1865)

North Coast Land Ownership Patterns

Where the Californios living along the California Coast to the south and east often lived on their Mexican land grants well into the 1870s, the three grantees on the North Coast seemed eager to dispose of their lands and move elsewhere. There were no Californios living on the North Coast by 1860 (Census of 1860). During the early years of statehood, the land that eventually became the Coast Dairies Property passed to newly-arrived settlers. The Aqua Puerca Rancho was bought by James Archibald, a native of Scotland; the San Vicente grant was purchased by Peter Tracy; the Rancho Laguna was bought by the Williams brothers (Clark, 1986).

The optimistic new Americans living in California operated at least four landings, mentioned frequently in the shipping records at the harbor of San Francisco.

Pigeon Point

The northernmost of the four landings was located on the south side of Pigeon Point in present-day San Mateo County. Pigeon Point served people living in the watersheds of Pescadero and Butano Creek as well as on the coastal terrace in the vicinity of Point Año Nuevo. By the early 1870s, the landing had a typical cable and winch system:

"At Pigeon Point there is a semicircular bay, partially sheltered from the northern winds, but the heavy swells rolling in from the southwest prevent any wharves being erected. Out about two hundred yards from the shore is a high monument-like rock, rising to a level with the steep rock bluff which half encloses the bay. From the bluff to the top of this rock stretches a heavy wire cable, kept taut by a capstan. A vessel rounding the reef runs into the sheltered cove under this hawser, and then casts anchor. Slings running down on the hawser are rigged, and her cargo lifted from her deck load by load, run up into the air fifty to one hundred feet, than hauled in shore, and landed upon the top of the bluff…This system is in extensive use along the coast…" (Evans, 1873)

Waddell's Landing

Several efforts were made to provide a shipping point on the south side of Franklin Point to ship the products from the dairies near Point Año Nuevo as well as the lumber and agricultural products from the valley of Waddell Creek. More will be said about this landing in the logging discussion below.

William's Landing

Located at the mouth of Liddell Creek, William's Landing was the most important of the early North Coast Landings. The Williams brothers owned the adjacent Rancho Arroyo de la Laguna and established the landing in the early 1850s (Clark 1986). The landing comprised a large hawser hanging over the water, its ends attached to the cliffs that formed a small cove. Small schooners would attach themselves to the hawser and loads of lime, lumber and agricultural produce would be lowered to the ship in a loading bin suspended from the rope. During the 1850s the harbormaster at San Francisco noted regular shipments from the landing including lumber, firewood and agricultural produce (*Alta* 5/10/1858).

An account published in 1867 provides a good description: *"It assumes quite a business air, on account of several fine roads from the timber region, and limestone quarries, north of the place. This port is the present shipping point of large quantities of lime and leather, tanbark, etc…Shipping is safe and easy, the vessel being moored to a large hawser extending across the estuary, from cliff to cliff."* (*Sentinel* 7/6/1867) William's Landing was not safe, in spite of the *Sentinel's* confident boosterism. On at least two occasions, lives were lost while attempting to load the wildly pitching ships. On July 12, 1857, two crewmen from the schooner *Harrison* drowned when they were knocked out of a small boat by the hawser (*Sentinel* 7/17/58) and in January of 1869, a small lime and lumber schooner named the *A. Crosby* was dashed on the rocks with her entire crew of five lost (*Sentinel*, 1/16/69) .

Davenport's Landing

In the fall of 1867, shore whaler John Pope Davenport[11] moved from Soquel to the small bay at the mouth of Molino Creek and began to build a wharf. A newspaper account in October of 1867 noted Davenport's early success: *"Already three schooners have cleared from the wharf with full freights of lumber, shingles and tanbark.* (*Sentinel* 11/23/1867)

By 1872, Davenport's Landing eclipsed William's Landing to become the primary shipping point on the North Coast, and a small community grew up beside the road that dipped down beside the beach. The landing boasted a hotel, saloon, general store, and blacksmith shop. A surprising variety of goods was shipped from the landing including lumber, posts, pickets, shingles, shakes, lime, tanbark, butter, cheese, dried venison and deer hides (*Sentinel* 9/21/1872).

The small community at Davenport's Landing was destroyed by a fire on April 26, 1913, and though some of the buildings were rebuilt, the town of Davenport that had grown up beside the cement plant took over as the commercial center of the North Coast (*Sentinel* 4/27/1913).

1.2.5.1 EARLY NORTH COAST AGRICULTURE

The dominant agricultural use of the North Coast up to 1900 continued to be livestock production. While the broader, flatter alluvial valleys of the Pajaro, San Lorenzo and Soquel Rivers were transformed from pasture to intensive agriculture (beginning with the potato boom in the early 1850s), the North Coast continued the pastoral tradition that had begun a century earlier. The coast's isolation and dearth of available labor certainly inhibited intensive farming practices, and the majority of the arable land was either of poor quality or too steep to grow anything but grasses or cereal grains.[12]

The North Coast's persistent summertime fog extended the growing season for perennial grasses well into the summer months (see Section 3.1.1), and the green hills above the coastal terrace became one of the Coast's emblematic views. Periodic droughts that often drove Central California's livestock industries into bankruptcy were not as severe here; during the drought of 1862-1864, for example, hundreds of thousands of cattle perished in the Salinas Valley and the adjacent hills. Enterprising North Coast ranchers bought Monterey County cattle for next to nothing and drove them into the hills and terraces of the North Coast, where enough survived to make selling them profitable once the drought ended.

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11 Shore whaling was the practice of hunting whales in thirty-foot whaleboats and then towing the carcass back to shore for processing. John Pope Davenport pioneered the practice on the Pacific Coast in Monterey in 1853 with a crew of Azorean whalers. Davenport moved his whaling operation to Soquel in 1865 and then moved to the landing at the mouth of Agua Puerca Creek. Though some historians have written that he whaled at this last location, there is no evidence to support that contention. He gave his occupation as whaler when interviewed by the census taker in Monterey in 1860, but he responded with the occupation of wharfinger when he was interviewed at the landing in 1870 (Census 1860, 1870; Orlando pers. comm., 2000).

12 The Project Archives (interviews) contain a discussion of early dry farming and dairying. The pattern of dairies and hay fields described by Frank "Lud" McCrary is probably close to the pattern in the late 1880s. See especially the annotated 1928 aerial in the Project Airphoto Archives for a depiction of early dry farming operations.

The North Coast Dairies

Dairying was a logical next step and a perfect match for the North Coast. The land was still in large enough parcels to support extensive grazing, and grassland was abundant. Perennial streams to support the water requirements for a dairy operation transected the terrace at regular intervals, now an asset at least as much as an obstruction. By the 1850s, what we might call the North Coast Model had developed: herds of cows grazing across the terrace and hills, with a dairy tucked down in each coastal valley, beside the stream and out of the wind. The dairies produced cheese and butter, commodities that could be shipped relatively easily and had a high value by weight. Those dairies close enough to Santa Cruz could transport their butter and cheese to Santa Cruz by wagon, while farther up the coast, it was shipped off Williams' and Davenport's landings.

The Marin County Dairy Connection

In the 1850s Marin County was the primary butter and cheese-producing region for the San Francisco market and many of the pioneer dairymen in Santa Cruz County came from there. Mr. L. K. Baldwin, himself a dairyman who migrated from Marin County, noted in 1879 that the North Coast dairies "are mostly owned by men who have been residents of Marin County, and been engaged in dairying there." (Elliot, 1879) Santa Cruz soon developed a reputation for producing a sweeter butter that commanded higher prices in San Francisco (*Sentinel* 1/4/1871). L. K. Baldwin summed up the reasons that he established his dairy on the North Coast: "*…we find the climate, grass and temperature pretty much the same as Marin, which requires a cool temperature, fresh, breezy air, good sweet grasses, pure water from our numerous springs and streams, and with cleanliness are not excelled in the manufacture of good, sweet butter by any place in the state.*" (Elliott, 1879)

Early Immigrant North Coast Dairymen

Though the majority of these early dairymen may have come from Marin County, they had very diverse immigrant backgrounds. Some, like James Hall, were from originally from New England. James Archibald, the dairyman at Scotts Creek, was from Scotland, and the manuscript census of 1870 lists several from Ireland. One prominent diary operator was Antone Silva (sometimes spelled Silvy), a native of the Azores Islands, Portugal.

Early Swiss on the North Coast

Scattered through the 1870 manuscript census we can find the origins of what later will become the Swiss-dominated dairy industry on the North Coast: John Stauband and Jaques Martin were Swiss-born dairymen, as well as Ambrose Gianone, also listed as working in a North Coast dairy. At that point in time, however, the majority of the Swiss living on the North Coast in the 1870s worked in the lumber industry, and most listed their occupation as woodcutters (Census 1870).

1.2.5.2 EARLY IRRIGATION ON THE NORTH COAST

It took the Spanish several summers in Central California to learn that irrigation was the key to successful intensive agriculture in this land of little or no summer rainfall. Early missions, such as that in the Carmel Valley, were hampered by their inability to get water up onto the mission terraces. Since the Spanish had no pumps, the only way they could water terraces was by bringing water down from above, through ditches and canals. It is not surprising that Father Palou, a veteran of several difficult summers at Carmel, noted the potential for irrigation on Santa Cruz's North Coast. In December 1774, while passing Laguna Creek, he notes: "*We then continued on our way in sight of the beach by a wide plain which skirts the range of hills, all good arable land with fine pasture. In half an hour we crossed an arroyo of more than two bueys of water which flows with the slope of the land. By means of it, it would be easy to water the plain, more than half a league wide, which we passed, and another one as long which reaches from the hills to the cliff on the beach.*" (Priestly, 1937)

Horace Gushee's Laguna Creek Irrigation Project -1873

A century later, in August of 1873, the first major irrigation project was undertaken on Laguna Creek by Horace Gushee. A newspaper reporter attended the picnic marking the opening of the flume:

"*Mr. Gushee invited some fifty friends and neighbors to a picnic on the occasion, and a right jolly good time there was in the pleasant laurel grove on the creek, about a half mile above the crossing. We attended early, so as to angle for trout before the company arrived. On starting up the creek, trout bit freely and the water was cloudy and running at full force; but when half through the cañon, the water suddenly diminished about one-half in quantity and force, so that we knew the creek had been tapped; the gorge is very narrow and extremely rocky, yet we made good time, climbing over huge boulders and around hanging cliffs until the open stream was reached, and the flume was visible, hanging above us on the eastern hill-side like a golden thread, wove by some fairy-wand in a single night. We proceeded up to a short distance below the dam, and then left the creek and started back down the flume—a distance of two and one-half miles to the present end of the ditch. The flume was brimful of pure, clear, sparkling water, rolling in gladsome volume, as if hurrying to reach the termination, where its invigorating and fertilizing effects would be brought into requisition, and utility appreciated. We followed the flume—which is staunch and strong—alternately walking on it and in the side-path, until we reached the first piece of ditch, where a break occurred, which let one-half the water out; hence the flume and ditch winds around the head of a steep cañon to the hillside, opposite Butler's old residence, where it strikes across the divide and to its termination, to be distributed over some 200 acres of land by numerous branches.*

A portion of the water will be conducted to the dairy-house, and thence over another large field of over 200 acres, below the house.

It is the intention of the proprietor to grow alfalfa, sugar beets, carrots, corn, etc, for stock and at seasonable times, irrigate the land so as to furnish green food for his dairy cows. The flume, with a six-inch head, takes out of the stream 144 square inches of water, which is about one-half the creek's supply at this season of the year. The enterprise is a new feature in Santa Cruz county, and if successful, will add materially to the value of agriculture and dairy lands along the coast. Mr. Gushee has already spent about $5,000 in ditching and fluming, and calculates to run small ditches in various directions to water stock and irrigate the land." (*Sentinel* 8/9/1873)

A North Coast Irrigation Rush - 1873

Within a month several other North Coast landowners were planning to follow Gushee's example:

"*We are informed that the plan adopted for irrigating the coast land, by Mr. Horace Gushee and Claus Spreckles* [sic][13] *is working an entire change in the diary business along the coast. Every dairyman along the many streams which drain the western slope of the Santa Cruz range,* [is] *preparing to flume or ditch the banks of the stream to lead the water out over the table land for household purposes. Mr. J.P. Laird, will, during the coming Winter and Spring, flume the San Bicente* [Vicente] *creek, and others up the coast are talking of similar enterprises. At Gushee's ranch south of the Laguna creek, a fine opportunity is offered of the advantages of irrigation, for grazing purposes. Where heretofore, in this season of the year, everything was dry as powder, now the soil is moist and covered with a luxuriant growth of vegetation, nearly a foot high. The stock of milkers are grazing it, and the return is more than double in milk, butter and cheese, than that from the dry uplands. About 200 acres are irrigated and next year as much more will be brought within the scope of the zanzas or irrigation ditches, and small distributing flumes. Alfalfa will be sown on the sandy soil below the road, and all over the sea-coast plateau below the road. The burr clover, alfilera* [newsprint is smudged] *and other native clovers and grasses do well, but are not so permanent and durable, in food or production as the alfalfa or Chili clover. Timothy, (or herd's grass) red clover, Kentucky, blue grass and sweet vernal grass will also be tried, as an experiment, and if found successful with irrigation will be adopted. There are at least twenty-five streams along the coast south of Waddell's creek, to the Pajaro, inclusive, that might be utilized with their tributaries for irrigation purposes….Mr. Gushee's farm is more valuable, since irrigated, by a third. Mr. Laird estimates that his land would be improved in value one-half, if he had now the waste water flowing into the sea through the San Bicente creek, to irrigate his land with."* (*Sentinel* 10/4/1873)

[13] Claus Spreckels had just purchased most of the Aptos Rancho and was laying out an extensive farming operation there, east of present-day Aptos.

1.2.5.3 EARLY NORTH COAST LOGGING

North Coast Logging Potential

The most prominent products stacked on the landings awaiting shipment during these early years were lumber, pickets, posts, shakes, shingles, tanbark[14] and firewood. The terraces that faced the ocean may have been treeless, but around the first bend of each of the coastal streams, hidden from the desiccating effects of the salt air, were groves of stunted coast redwoods. And with each succeeding bend in the canyon, the trees grew larger and the groves more pronounced until, in the upper reaches of streams on the west flank of Ben Lomond Mountain, stood some of the most valuable timber stands in all of Santa Cruz County. Lumbermen marveled at the logging potential, but, from the 1850s into the 1880s, they did not have the technology to get the logs or lumber out of the canyons and out to market. None of the North Coast streams had a volume of water sufficient to carry logs down to the landing (as was practiced on the coast of California north of the Golden Gate), so the logs either had to be skidded down using oxen, or processed where they fell. The best the lumbermen could do was fell the redwoods closest to the landings and split them on site, carrying the posts, pickets or shakes out to the landing on mules or wagons. These "split-stuff" operations were episodic, blooming when the price of lumber was high, and wilting when the price dropped and the statewide economy was depressed. Because Marin County could get redwood lumber to San Francisco markets more cheaply, the North Coast timber industry remained relatively dormant until the end of the nineteenth century (see Photo 1-1).

Courtesy Frank "Lud" McCrary

Photo 1-1: Grovers Mill on Laguna Creek. Date Unknown, ca. 1880

[14] The bark from the tanoak tree was the source of tannin for the early tanning industry in California. The trees were felled, the bark peeled from the logs and shipped off the landings. See Lud McCrary Interview, Appendix 1.2.1.

William Waddell's Mill and Landing

The major exception to the primtive aspects of North Coast logging was the construction of a steam sawmill in 1862 by William Waddell on the stream that eventually bore his name. Blessed with a stand of timber "more extensive and compact" than any other on the North Coast, Waddell built his sawmill about two miles inland, and then brought the finished lumber down on small railroad cars that rode on wooden rails (*Sentinel* 4/16/1864).

Waddell built a series of wharves near the mouth of the creek off which to ship his lumber, but the ocean always succeeded in turning them into kindling. The most successful method for off-loading lumber continued to be the system of winching it out to ships anchored offshore. An unfortunate encounter with a grizzly bear in October of 1875 permanently interrupted Waddell's operation.

1.2.5.4 THE EARLY LIME INDUSTRY

The other early industry, one that will have a direct bearing on the Coast Dairies story, involved the huge limestone deposits that underlay most of Ben Lomond Mountain. Isaac E. Davis and Albion P. Jordan developed those deposits closest to Santa Cruz beginning as early as 1849. As the local newspaper noted in 1856, "*The supply of lime rock is inexhaustible of the blue, grey and crystallized varieties; in most localities where the rock is found, the land is covered with timber, to be used in burning"* (*Sentinel* 7/26/1856).

Early Santa Cruz Lime Kilns

The limestone was heated ("burned") in high-heat kilns and the resultant lime was packed in barrels and sold throughout the West to make mortar and whitewash. Since the limestone deposits were located uphill from Santa Cruz, it was a relatively easy downhill trip for the heavy barrels of lime. A wharf was built where present-day Bay Street in the City of Santa Cruz intersects the coastal bluff, and a steep wharf extended into the Bay specifically for the shipment of lime. Davis and Jordan had a virtual monopoly on the state's lime industry and were able to control prices by restraining production. By 1870, the dollar value of lime shipped out of Santa Cruz was higher than any other commodity, even lumber (*Sentinel* 1/22/1870).

North Coast Lime

As it had with the lumber industry, the North Coast's isolation and lack of dependable shipping restrained the development of the lime industry. It had two of the necessary ingredients—limestone and forests—but it lacked the access to market enjoyed by the lime operators at Santa Cruz. There were several efforts made in the 1860s to ship lime off the landings at Williams, Davenport's and Waddell's, but they were usually brief and only marginally successful.

San Vicente Lime Company

Perhaps the most successful lime operation, and a harbinger for the later story of cement, was the establishment of the San Vicente Lime Company in June of 1875. The company built four lime kilns inland on San Vicente Creek and built a new, thousand-foot long wharf at Davenport's Landing. They planned to ship the barrels of lime on the coastal steamer *San Vicente* (*Sentinel* 6/19/1875). During the month of September, the lime company shipped over 4,000 barrels of lime from their new wharf, and the business appeared to be off and running (*Sentinel* 10/9/1875). In early October, however, as it had with all previous wharves along the North Coast, high waves shortened it by over 300 feet. With its wharf truncated by the sea and the economy in the grip of a serious depression, the company ceased operation (*Sentinel* 10/16/1875). The huge limestone deposits on the North Coast remained undeveloped, awaiting the arrival of dependable transportation.

1.2.5.5 NORTH COAST SHORE WHALING

The only documented shore whaling station on the North Coast was located just north of the landing apparatus at Pigeon Point. As noted earlier, there is no evidence that anyone ever whaled from the vicinity of Davenport's Landing or processed any whales on that beach.

Pigeon Point Whaling Station (1862 – 1900)

By the early 1860s, the Monterey shore whaling scene had become so crowded that two Azorean[15] whaling companies decided to move, one to Point Lobos (on Carmel Bay) in 1862 and a second to Pigeon Point[16] in 1864 (*Gazette* 9/23/1864). The whales were hunted for their oil, which was acquired by boiling the blubber in huge kettles, called trypots, set up on shore. Once the blubber was removed from the carcass, the remaining meat and bones were discarded, much to the delight of the grizzly bears living in the nearby mountains. Since California shore whaling was pursued only for whale oil, when the price of oil began to drop (following the advent of kerosene in the 1860s) the industry became less and less profitable. Even when the price of whale oil was at its highest, the Azoreans only saw the dangerous business as a part-time occupation. At Pigeon Point, as in the Azores, the whalers were half-time whalers and half-time farmers (Santos, 1995).

The shore whaling industry in Central California ended in the late 1880s, but not because of a dearth of whales. Within a season, the whales, who had been migrating well off the coast, moved their route back, and by 1890 they were cavorting in Monterey Bay in full view of the retired whalemen. A Monterey newspaper complained, *"Whales have been so thick in the bay of late as to make fishing exceedingly hazardous. They come into the bay about dusk and pursue the mackerel all night long, much to the detriment of the fishing industry."* (*Cypress* 8/9/1890)

[15] Though the Azores Island were part of Portugal and emigrants from there were technically Portuguese, they preferred (and continue) to be called Azoreans (Santos, 1995).

[16] Pigeon Point was named for the clipper ship *Carrier Pigeon* that wrecked there in 1853 (*Alta* 6/10/1853).

In the late 1890s, for reasons not yet understood, the shore whaling industry revived for a couple of seasons, and the Pigeon Point Whaling station followed suit: *"The Pigeon Point Whaling Co. have been making some fine hauls of their immense game lately. They captured several fine whales within a few weeks, chiefly 'California greys.' The boys are much encouraged at the prospect of a very profitable season."* (*Surf* 2/4/1898) Despite whalers' successes at Pigeon Point and elsewhere, by 1900 the old-fashioned shore whaling industry on the California coast was at an end. As the twentieth century dawned more modern methods were used to pursue a dwindling supply, and they supported a struggling industry elsewhere on the Central Coast until 1924 (Lydon, 1984).

Though no whaling ever occurred at present-day Davenport, the increasing popularity of whale-watching in the 1970s led to the town's adoption of a whaling motif. The large whale-shaped Davenport sign on the west side of the highway and the name "Whale City" that adorns the bakery and tavern in the center of town continue to be a cherished emblem of whaling at this spot.

1.2.5.6 EARLY NORTH COAST TOURISM

Isolation as an Asset

The very isolation that frustrated the development of the North Coast's forests and limestone deposits made it attractive to those seeking a place to camp, fish or hunt. In the 1860s a growing number of factories and mills lined the San Lorenzo River, and the stream became increasingly diverted, dammed and flumed. With the pollution caused by dumping effluent and sawdust directly into the river, it is easy to understand the decline in recreational potential on the San Lorenzo and nearby Soquel. Meanwhile, the North Coast streams continued to be relatively unspoiled.

San Vicente Creek

An article written in 1866 placed San Vicente Creek at the top of the county's streams:

"The best [trout fishing] stream probably, is the San Beicente [San Vicente], ten miles up the coast, a large creek emptying into the sea. In this stream, trout bite as rapid and as strong as in Eastern streams, and [are] even more abundant and delicious. The largest trout caught (by Mr. Begelow, the insurance agent), being over 22 inches long and weighing about four pounds. In this stream the largest average from ten to fifteen inches." (*Sentinel* 1/13/1866)

Laguna Creek

In a lengthy article meant to be a guide to the camping and fishing spots in the county, a trout season-opening article written in April, 1874 touted Laguna Creek:

"Probably the best known fishing and camping ground [in Santa Cruz County] is Laguna Creek, situated about nine miles up the coast…The beauty and attractiveness of this spot, the scenery and surroundings alone are sufficient without its fishing advantages to call forth a visit from all strangers. There are but few who visit Santa Cruz but also explore Laguna Creek. Starting, say two or three miles back from the coast and following the creek down to its mouth, ending in the lagoon, a day's fishing would probably give to the experienced angler from ***one hundred and fifty to two hundred trout****.* [emphasis added] *The trout, though very plenty [sic] in this stream, are not as large as in many of our other streams. Experienced anglers, however, prefer these smaller fish to the larger, being sweeter and daintier to the taste. Salmon trout, very large, are also frequently caught at Laguna Creek.* (*Sentinel* 4/4/1874)

"Trout Slaughtering"

Since there were neither limits on size or number of fish taken, the numbers of trout taken from the streams was often astonishing. The year 1891 was a tough one for North Coast trout. An article published in early June noted: *"Messrs. Tom Dakan and Rob Dudley whipped the San Vicente for trout Sunday with immense results. Eight hundred and fifty is the record they are willing to make their affidavit on, and all caught with a hook."* (*Surf* 6/2/1891) Later in June, 1891: *"Chas. B. Richardson drove a merry party to Scotts Creek Saturday and the trout slaughtering was a great one. Here it is, beginning at the largest catch.."* The article then listed a total of 1,516 fish taken between seven anglers with one named "Bootsie" taking 675 (*Surf* 6/30/1891).

Some North Coast residents didn't bother with the niceties of hook and line. As the fish populations began to decline, local Fish Patrol wardens [17]stepped up their efforts to stop the wholesale depopulation of local streams. A San Francisco newspaper noted in 1891 that, along the North Coast there was an "unpleasant state of affairs": *"The Portuguese, who live within close proximity to the streams, have been slaughtering young grilse by the thousands and salting them down for their own use. The law-breakers use giant-powder cartridges and seines which reach from bank to bank, thus preventing any possibility of the fish ascending the stream."* (*Surf* 10/5/1891)

Organizations to Foster Trout Planting and Habitat – 1875

From the early 1850s, trout fishing was a popular attraction to bring visitors to Santa Cruz County, and, as the streams became heavily encumbered with factories and mills, and fishing pressure increased, many saw the need for restocking the county's streams. In the late 1870s, an organization named "The Santa Cruz Organization for the Propagation and Protection of Fish" was formed. The organization was committed to helping catch game law violators as well as encouraging the stocking of local streams. In 1878 10,000 trout were brought in from a state hatchery and planted throughout the county. Described as the "McCloud River variety of trout" the fry were two months old and approximately one inch long (*Sentinel* 4/20/1878). A plant of

[17] The California State Fish Commission was established in 1870 and, as the Fish and Game Commission, began to hire wardens in 1878. The warden in Santa Cruz County reported to the county Board of Supervisors.

1,250 pounds of "Eastern trout fry" was made throughout the county in 1892, again under the auspices of a local fishing club (*Surf* 4/20/1892) (see Appendix 1.2.2, interview with Tom and Richard Dietz, for a description of hunting and fishing in the 1920s-50s).

1.2.5.7 NORTH COAST ABALONE

The two primary consumers of abalone—Native Americans and otters—were all but removed from the Central California coastline by the late 1840s, and the Yankees who came into California with the Gold Rush considered them to be nothing more than very large, inedible snails. For the Chinese, however, the mollusks were a delicacy, and they knew how to dry them for shipment across the Pacific. The California coast must have looked like heaven to a fisherman coming from the heavily fished Chinese coast, and they were the first to harvest abalone commercially in California. Using pry-bars, wedge-tipped poles and gaffs, the Chinese worked the intertidal zone (the Chinese never dove for abalone in California), gathered abalone, dried and baled the meat and shipped it to Chinese markets in San Francisco and across the Pacific. The shells were sold to button and jewelry manufacturers, and oftentimes they brought higher prices, per weight, than the meat (Lydon, 1985).

In the 1880s, harvesters and consumers began to change. John Carpy, the owner of a Santa Cruz seafood restaurant obtained a secret recipe "from an old Spanish woman at Monterey" which made the abalone meat "soft and tender." Carpy was reluctant to divulge the secret, but said that he was not only cooking and selling them in Santa Cruz, but also shipping abalone prepared with his "secret" to restaurants in San Francisco (*Surf* 11/10/1883).

Carpy was getting most of his abalone from the North Coast, which had heretofore been largely unexploited. An account in 1894: *"On Sunday a party of abalone gatherers drove into town* [Santa Cruz] *with an immense wagon load of abalones, which they had gathered some thirteen miles up the coast. They had 118 in all. They are gathered for the San Francisco market."* (*Surf* 1/2/1894) By 1898, the mollusk was evolving into a "toothsome univalve": *"Tom Amaya was on the streets* [of Santa Cruz] *today with a wagon load of abalones. These toothsome univalves, once so plentiful near Santa Cruz, have been 'hunted' out until a successful gatherer must now go some distance along the coast. Amaya's load was the result of a two day's trip as far as Pigeon Point."*(*Surf* 1/6/1898) In 1901: *"The extreme low tide yesterday afforded mussel and abalone gatherers to reap a large harvest. Perhaps the most successful in the latter line were Joe Perry and George Bowes who brought down two wagon loads gathered from the rocks near the Yellow Bank." The abalones were monsters in size and found a ready market."* (*Surf* 1/2/1901)

"Abalone Tides"

All three of the above occurred during January when the lowest tides occur on the North Coast. Low tides were locally known as "abalone tides" as they were most often associated with gathering abalone (Photo 1-2).

Courtesy Hulda Hoover McLean

Photo 1-2: Abalone Tide. Date Unknown

China Ladder

The Chinese presence on the terrace north of Davenport's Landing was persistent enough to name a local access point for them, and local Davenport residents remember a ladder leaning up against the coastal bluff down which Chinese abalone hunters climbed to have access to the isolated intertidal rocks. Donald Clark gives the following explanation for the name: *"The name applied to an access point along the shore of the Pacific about one-half mile southeast of Pelican Rock. On top of the bluff was a shack in which lived several Chinese, who obtained abalone from the rocks below and dried them for the Chinese trade. From the bluff they followed a trail, then down a rope, and finally a ladder to reach the beach."* (Hoover, 1966) *"The beach at the foot of China Ladder was known as China Ladder Beach, and the nearby gulch became known as China Ladder Gulch."* (Clark, 1986)

Japanese Abalone Divers and Hard-Hat Diving in Central California

In 1898, a group of Japanese immigrants imported the technique of hard hat diving to Point Lobos just south of Monterey. Since the Chinese had not ventured any deeper than they could reach with a pole at low tide, the abalone beds beyond that depth were virtually untouched. At first the Japanese fishermen dried the abalone as had their Chinese predecessors, shipping the dried meat back to Japan. But the Japanese soon added a modern cannery to their operation at

Point Lobos, and the canned product began appearing in local stores. As the business grew, the Japanese divers expanded their range, venturing ever-farther south along the California Coast, following the path that the Chinese intertidal gatherers had laid down decades earlier. (Lydon, 1997).

The Japanese immigrants not only inherited and modernized the abalone industry pioneered by their Chinese predecessors, they also fell heir to the anti-Asian racism that characterized so much of California's history. From their entry into the abalone business, the Japanese and their techniques became the targets of both county and state regulations. Between 1899 and 1939, the Japanese divers worked within an ever-tightening net of rules and regulations. By imposing minimum diving depths and closed areas, the Japanese were driven south down the coast from Monterey and deeper into the water.[18]

Meanwhile, increasing pressure was being brought on the abalone resource by non-Japanese abalone hunters. Several marine biologists argued that it was not the Japanese divers who were decimating the resource, but the "sportsmen" who used extremely low tides to harvest their huge catches. In January of 1912, for example, we have the following note in the local newspaper: "*A wagon piled high with abalones was on the street today. In it were a part of 800 of these shellfish that were gathered by Joe Fritz and L. Kelly at New Years Point."* (*Surf* 1/4/1912) In 1940 the leading abalone biologist in California noted that the disappearance of the abalone from the intertidal area should be laid at the feet of the sport fishermen, not the commercial divers (Bonnot, 1940). Following their forced internment during World War II, the Japanese did not return to the abalone industry.

1.2.5.8 DEVELOPMENT OF NORTH COAST WATER RESOURCES – THE 1890S

Water for the City

Beginning in the early 1850s, Frederick Augustus Hihn supplied water to Santa Cruz through his private water system, the Santa Cruz Water Company. The two main sources of water were the springs above the site of Santa Cruz Mission and upper Branciforte Creek. A second private system was developed on Majors Creek in the early 1880s and managed locally by W.H. Duke. In the mid-1880s the Duke system collapsed financially, and the City of Santa Cruz, seeking an alternative to the Hihn monopoly, began efforts to acquire the system. They waited too long, however, and Hihn bought the system before the city could act. In response, Santa Cruz then decided to develop its own water system. In 1889, after investigating the potential of a number of coastal streams (including Branciforte Creek, Carbonero Creek, and Majors Creek), the city decided that Laguna Creek had the greatest potential (*Surf* 9/17/1889; 9/18/1889; 12/7/1889).

Construction of the city's Laguna Creek water system began in the spring of 1890 and was completed in December of that year. A dam was constructed on the creek and a ten-mile water main, 14 inches in diameter, carried the water to a 60,000,000-gallon reservoir located above the

[18] For a complete list of the regulations, see Lydon, 1997, p. 85.

city on High Street. The system was able to deliver water at ninety pounds pressure at its hydrants on Cooper Street in downtown Santa Cruz (*Surf* 9/30/1890; 10/17/1890).

Big Creek Power – 1896

With their municipal water system in place, the City of Santa Cruz began to look for electric power, along with almost every other California municipality: *"In the 1890-1900 decade, the fever of hydroelectric development was sweeping California. Men everywhere were looking for sites where water could be dropped from higher elevations to drive wheels and turbines at streamside."* (Coleman 1952) In 1895 the transmission of hydroelectricity over a long distance was proven possible by the opening of an electric system between generators at Folsom and the City of Sacramento 22 miles away (Coleman, 1952). The Folsom system inspired others throughout the state to build similar systems, and not surprisingly, Santa Cruz leaders began looking toward the North Coast.

In 1896, Duncan MacPherson, the editor of the Santa Cruz *Sentinel*, urged the city to investigate the possibility of using Horace Gushee's irrigation dam on Laguna Creek to form the basis for a city-owned hydroelectric facility. Once again the city was outrun by an entrepreneur. Fred Swanton went farther up the coast to the Scotts Creek watershed, surveyed the hydroelectric potential of Big Creek, and in what he later claimed was a record fifty-eight working days, constructed a hydroelectric system from scratch. On June 12, 1896, the falling waters of Big Creek drove a generator that pushed electricity seventeen miles to Santa Cruz for a huge, public party in front of the Odd Fellows building on Pacific Avenue (*Surf* 6/13/1896). *Surf* Editor Arthur Taylor expressed mixed feelings about the system, recognizing the price that the creek had to pay for the power:

"*The stream known as Big Creek which empties into the ocean about twenty miles up the coast is one of the largest streams in the county and flows through a most picturesque and romantic canyon. It has been a favorite trout stream since American occupation of California, barring the obstruction of three falls, one 90 feet, one of 60 feet and one of 250 feet. Many an angler has questioned the wisdom of placing these obstructions in a good trout stream where distance, declivities and boulders combined to render them inaccessible to sightseers, but this is all solved now for we know that those falls are what has made the Bgt Creek Electric Light and Power Company's scheme a success."*(*Surf* 6/10/1896) (see Photo 1-3)

During the first two years, Big Creek power was off as often as it was on. Swanton and his engineers could not have timed their hydroelectric venture at a less opportune moment, as the seasons of 1897-1898 and 1898-1899 saw less than half of the typical rainfall. By the second year of the drought, the flow in Big Creek no longer had sufficient volume to drive the generator and Swanton had to purchase a steam generating plant and install it to supplement the hydroelectric equipment (*Surf* 12/21/1898). Meanwhile, the persistent wind and salt air of the North Coast played havoc with the transmission line into Santa Cruz. In 1900, when he was approached by several investors who wished to purchase the company, Swanton was ready to sell. The new owners refurbished the dams and flumes and re-routed the transmission line by running

Courtesy Frank "Lud" McCrary

Photo 1-3: Big Creek Powerhouse with Steam Generation Equipment ca. Late 1890s

it directly over the mountain to Ben Lomond and then down along the San Lorenzo River into Santa Cruz. (*Surf* 2/6/1900). Other improvements were made and the power plant continued to provide electricity through the 1930s. The wildfire in September of 1948 destroyed a considerable part of the flume work and dams, and the last owners (Coast Counties Gas and Electric) did not replace them. The power plant site is still marked on the current USGS. quadrangle.

1.3 THE COMING OF COAST DAIRIES: TRANSFORMATION

One afternoon in April, 1901, Louis Moretti and Jeremiah Respini shook hands at the Santa Cruz County courthouse, a defining moment for the Coast Dairies Property. The signing of the incorporation papers for the Coast Dairies & Land Co. formalized a relationship that had existed for a number of years. The corporation not only combined the considerable real estate owned by Louis Moretti and Jeremiah Respini, but it also had a liberating effect on the entrepreneurial energies in the two men. The words "dairies" and "land" suggest something bucolic: cows grazing lazily across the coastal hills being tended by patient, hardworking dairymen. There continued to be dairies on the property, of course, but the cows were soon sidelined by a surge in

industrial enterprise. By the end of the first decade of the twentieth century the natural resources of the North Coast were unlocked and the peace and quiet replaced with the growl and whine of crushers, saws and steam locomotives (see Figure 1-2).

1.3.1 NORTH COAST BITUMIN MINING AND THE OIL RUSH OF 1901

Since the 1860s, geologists had been confidently predicting that there was oil on the North Coast. The early years were dominated by miners and engineers trying to extract oil from the black asphaltum that oozed from the surface of the earth just north of Majors Creek on Rancho Refugio. Using retorts to heat and distill the oil from the mixture of oil and sand, a series of oil companies worked unsuccessfully to make the process pay (*Sentinel* 5/28/1864). It was much easier to mine the asphaltum material and use it for paving, a practice that began in the early 1880s. By 1887, many of the primary streets in Santa Cruz had been paved with the black material, and sixty tons per day were being taken out of the surface mines:

"The material is found in enormous quantities in the section commonly known as the 'petroleum district' from eight to ten miles up the coast from [Santa Cruz], *where it exists in stratas of from four to forty feet in thickness, to an extent not yet explored. There are abundant outcroppings over an area of about two miles. The rock quarried thus far has been taken from…the upper canyon of the Cajo or Majors creek, but last spring good indications were discovered near the ocean shore, along the same canyon on the property of Pio Scaroni*[19]." (*Sentinel* 10/6/1887) In 1889 the company shipped 300 tons from the North Coast mine to Seattle (*Sentinel* 2/14/1889). As with all North Coast resources, however, it was a continual challenge to get the bitumin to market. In the early 1890s a bitumin mine near San Luis Obispo could get their product to San Jose cheaper than the mine on the North Coast (*Sentinel* 11/9/1891). The bitumin was waiting for a railroad.

The first glimmer of the North Coast's transformation came in the opening months of 1901, when a gaggle of geologists began poking around the coastal terrace looking for oil. Logic suggested that, if oil-bearing sands emerged from the earth at that spot, there had to be pools of oil lurking underground somewhere in the vicinity. Spurred by reports of large oil deposits found throughout California and even larger fortunes earned by lucky investors, oil-drilling rigs popped up almost overnight throughout Santa Cruz County. The Santa Cruz Oil Company, funded by local investors led by the indefatigable Fred Swanton, negotiated a lease with a number of North Coast property owners (including Jeremiah Respini), and began drilling on the Scaroni property, very near the bitumin beds. Other companies quickly followed, and soon there were daily reports published in the Santa Cruz newspapers giving well depths and the cheerful predictions of the geologists.

[19] Swiss-born Pio Scaroni established a dairy on part of the Rancho Refugio, just south of Laguna Creek, in 1868 (Clark, 1986). He and his descendants owned and lived on the property until 1998, when the property was sold to become part of Wilder Ranch State Park.

INSERT FIGURE 1-2
THE NORTH COAST-THE MODERN PERIOD
(11 x 17 color page 1)

INSERT FIGURE 1-2
THE NORTH COAST-THE MODERN PERIOD
(11 x 17 color page 2)

Oil was found in some of the wells, but it was measured in buckets, not the barrels necessary to make the operations profitable. By early 1902, the *Santa Cruz Surf* said that the oil boom seemed to be busted" (*Surf* 1/8/1902). The Santa Cruz Oil Company ceased drilling on the North Coast and the leases ran out. But the miners continued to work the bitumin pits just as they had since the 1860s, loading the heavy dark rock into wagons and hauling it to Santa Cruz for shipment.

1.3.2 PORTLAND CEMENT

Lime and limestone-derived products usually led Santa Cruz County's annual list of industrial production throughout the nineteenth century, and the phrase "Santa Cruz lime" was known and respected throughout California .(*Sentinel* 10/15/1870) Most of the production was controlled by the company owned by Henry Cowell, with its kilns on the hill above Santa Cruz and its long, sloped wharf extending off the cliff just west of town. Other companies tapped into the limestone on both flanks of Ben Lomond Mountain (including several companies on the North Coast), but Cowell had the singular advantage over his competitors of easy access to a dependable wharf and outside markets.

One of the lime-based products that grew increasingly valuable as the twentieth century began was Portland cement. Construction using brick and mortar (lime was used in making mortar) was giving way to concrete, in which the main ingredient was cement. Portland cement was made by burning a combination of limestone and shale, and then grinding the result into a fine powder. Ben Lomond Mountain had both ingredients in abundance, and at least one Portland cement operation had been operating off and on about a mile upstream on the San Lorenzo River since the early 1880s.

Where lime could be produced using a relatively simple technology—all that was needed was limestone, a kiln, lots of firewood, and strong men—Portland cement required some sophisticated equipment to get the proper combinations of ingredients heated to exacting temperatures. In Santa Cruz County, capital was the only factor missing from the equation, but it arrived in 1903 in the satchel of William Dingee, commonly known as the "Cement King." Dingee, through his Standard Portland Cement Company, owned cement plants in Napa California, Bellingham, Washington, and Pennsylvania. He saw the potential offered by Ben Lomond Mountain and proposed to build a cement plant on the brow of the hill just above Santa Cruz.

The debate that raged in Santa Cruz over Dingee's cement plant proposal has a very contemporary feel to it. Some, like the editor of the *Santa Cruz Sentinel*, argued that the plant would bring dependable economic benefits to the community. With the redwood forests fast being turned into lumber, the cement plant could provide a stable economic base for years to come. Others, however, were fearful of the impact that the plant would have on the town's air and ears. Arthur Taylor, the Editor of the *Daily Surf*, suggested that the plant could very well ruin the quality of life in the town. By 1904, it appeared that Dingee might not get the necessary support from the Santa Cruz Town Council.

Meanwhile, Dingee and Louis Moretti of Coast Dairies & Land Company had been talking. It is not clear whether Moretti approached Dingee or vice versa, but by early 1905 there were rumors flying in Santa Cruz that Dingee was moving his proposed cement plant from noisy and contentious Santa Cruz to the isolated canyons of the North Coast. In May of that year, Taylor's *Surf* reported that Dingee had optioned 130 acres of Coast Dairies land on the north side of the mouth of San Vicente Creek for a factory. By moving the plant up to the North Coast, however, Dingee was leaving behind the necessary access to transportation afforded by Santa Cruz's wharves and railroads. Dingee's stated plan was to ship cement off a new wharf at Davenport's Landing, but Taylor hinted that there was something else in the offing: "*While independent shipping facilities will be provided, it is a moral certainty that if a cement factory is established a coast railroad will be constructed*…"(*Surf* 5/6/1905)

1.3.3 SOUTHERN PACIFIC RAILROAD

Apparently Dingee had been talking to a lot of people, including the leadership of the Southern Pacific Railroad (SPRR). Several weeks later, SPRR announced that it would be extending its line northward from Santa Cruz to San Francisco along the coast. In reality, as railroad historians have noted, the Southern Pacific had no intention of building all the way to San Francisco. Their goal was to build a twelve-mile line that would end at the cement plant. The freight generated by the cement plant would be enough to support its construction (Hamman, 1980).

The Ocean Shore Electric Railway

Meanwhile, in early 1905 and totally unrelated to the cement plant planned for the North Coast, a group of investors incorporated the Ocean Shore Electric Railway and began surveying for a railroad to run along the coast between San Francisco and Santa Cruz. Their plan was to begin at both ends and work toward the middle, planning to meet somewhere in San Mateo County. As originally planned, it was to be an electric-powered railroad and would have two sets of tracks. The Ocean Shore Electric was born on paper on May 18, 1905. At the beginning of 1905, the North Coast had no railroads, but within six months it had the prospects of two, with *three* sets of track (Wagner, 1974).

The thought of the fledgling Ocean Shore competing side-by-side with the gargantuan, state-controlling, infamously ruthless Southern Pacific was daunting, but very early on the two railroads reached a moderately cooperative arrangement. The Ocean Shore was the first to begin construction northward out of Santa Cruz, but it had to bring its equipment in over Southern Pacific track. The two companies decided to lay their tracks side by side with the Ocean Shore taking the outer (ocean) side of the right of way and the SPRR the inner. Since there were to be three sets of tracks, the original right of way and the cuts and fills[20] were much wider than usual.

[20] Cutting and filling was the process used by railroad and highway builders to achieve a level grade by digging a channel into a hill and pushing the loose material into the next depression to build it up. The resulting cavity through which the railroad or automobile runs is known as the cut, while the filled in area in the depression is known as the fill.

The Ocean Shore was the first on the ground and could take advantage of any of the freight being generated by the construction of the cement plant beside the San Vicente. However, the Ocean Shore also knew that, once its rival had completed laying their own track, they would lose all the cement plant freight and would have to depend on the revenues generated from daily traffic between San Francisco and Santa Cruz.

Construction of the Ocean Shore Electric Railway

While the Ocean Shore waited for materials to arrive, they leap-frogged a large crew of laborers up to Waddell Creek and blasted a railroad grade across the base of the historically pesky bluff: "*The Ocean Shore engineers, with audacity and dynamite, are doing in a few days what Nature has been lazily working at for ages. In other words, they are blasting down the bluff to make a clear grade for railway and highway at this hitherto perilous place*." (*Surf* 6/15/1905) Their reason for racing up to Waddell's was designed to block the Southern Pacific (or anyone else) from getting past that point without drilling a tunnel. They also purchased rights-of-way and made immediate cuts at other rocky points farther up the coast, San Gregorio Bluff and Mussel Rock Bluffs. The Ocean Shore believed that "[their] *control of these places makes it absolutely necessary for a competing line to resort to tunneling to get past these places, requiring approximately four miles of tunnel in a distance of fifty (50) miles of road."*(*Surf* 10/2/1907) Meanwhile, the railroad had to deal with the very issue they intended to solve: getting the necessary lumber delivered ahead of their northward march out of Santa Cruz. By August of 1905 large loads of Douglas fir poles were being loaded off ships and rafted to North Coast beaches and the trestle building began.

The Ocean Shore Trestles

The plan was to build the trestles across the gullies and lagoons and then fill them in with rock and earth. "*All these trestles except the one just beyond Wilder's are to be filled and must be filled before heavy trains can pass over them. This work is on joint account between the two companies, and the embankments, when complete will be 36 feet wide at the top, capable of accommodating three tracks*." (*Surf* 2/3/1906) Material taken from the cuts was loaded into special side-dumping gondolas and then dumped off the top of the trestles. The result was a string of huge earth-and-rock ramparts each one containing a reinforcing wooden structure as its heart (see Photo 1-4 and Photos 14, 15, and 16 in Appendix 1.3 for a depiction of the sequence of trestle filling).

CourtesyCovello and Covello, Santa Cruz

Photo 1-4: Filling the Trestle South of Davenport, View to the North to Davenport and the Cement Plant

The Ocean Shore Stream Tunnels

Rather than direct each stream through a culvert beneath the trestle, the railroad engineers chose to cut tunnels through the rock on the north side of each of the canyons. The engineers picked the north side of the canyons because they knew that the littoral drift on the coast was from north to south, and the tunnel mouths were much less likely to be filled with sand if they were on the "uphill" side of the beach drift. Further, each tunnel was drilled so that it emptied out a little above the land on the ocean side to insure that seasonal high sand levels did not block it. The pattern holds throughout the Coast Dairies Property: at each trestle fill there is a tunnel through the rock on the north side of the ravine.

One contemporary observer, Arthur Taylor of the *Surf* newspaper, was uncertain of the effectiveness of the tunnels, and in a remarkable article written in 1906, he expressed his skepticism: "*Tunnels have been excavated in the solid rock walls of the canyon into which the running streams will be conveyed as fast as the fills are complete. The Old Settler shakes his head when he looks at these holes in the wall, but the Civil Engineer says they are of capacity to carry all the water that can come. Time will tell."* (*Surf* 2/3/1906)

Now, almost a century later, after repeated earthquakes and floods, the tunnels continue to gather the upstream water and deposit it on north side of each cove.

The Legacy: The Railroad Ramparts

The effect of these huge earthen walls on the coastal landscape was, and continues to be, dramatic. Because they were built with a 36 foot width at the top, their bulk is such that when one is standing on them, they appear as if they had been leveled out of the existing landscape.

When viewed from the ocean side, the ramparts make the coast appear as one continuous, level wall. Each of the beaches along the rampart is backed by a huge, steep, smooth-faced slope. Some, like the fill that crosses behind the San Vicente beach, still exhibit their unconsolidated heritage by confronting the hiker with an unclimable bank of scree. Since the fill slopes are too steep to walk, pedestrians have cut trails down to the beaches on the natural bluff faces, and many of them are precarious and rugged.

The effect on the landward side of the ramparts is even more dramatic. Standing at stream-level one cannot see the ocean at all, and the wall blocks the prevailing-onshore wind as well as the late afternoon sun. More importantly for the residents of the North Coast, the railroad fills blocked access to the beaches and lagoons, and since the original coast road looped in and out on the landward side of the railroad line, the residents in each of the coastal valleys were cut off from the immediate coast.

Even when the coast road was straightened and leveled with its own cuts and fills beginning in the late 1930s, the highway grade was below that of the railroad so that each time Highway 1 drops down into one of the valleys, there is a wall on the ocean side blocking any view of the beach. The tradition of hidden "secret" beaches is one of the railroad's legacies, with "clothing optional" beaches and homeless encampments dotting this coastline, effectively screened off from the highway by the walls of earth built by the Ocean Shore Railroad. It is possible to regularly drive along this coast and never know there are beaches at San Vicente, Liddell, Yellowbank or Laguna.

Editor Taylor of the *Surf* was particularly distressed with the effect of the railroad fill at Laguna Creek. Laguna was famous in the nineteenth century for a large stand of California laurel trees that grew upstream from its coastal lagoon, and many early accounts extol the virtues of the place as a picnic ground. Taylor expressed distress at what the railroad did to the grove: "*Laguna, grown sacred as a shrine of summer rest and joy to thousands has been cut in twain by a trestle, which will soon become a solid embankment hiding the ocean and shutting off the heavens from the remaining part of the grove.*" (*Surf* 2/3/1906) Laguna continued to be the social center for the North Coast community and even today, there are picnics in the laurel groves inland from the railroad line. And there are still several old, gnarled laurels on the ocean side of the rampart, their bark etched with initials and carvings that may date to those days before the railroad came marching inexorably through.

Taylor saved his strongest words for the effect of the railroad and the burgeoning cement plant on San Vicente Creek. San Vicente had been the crown jewel of Santa Cruz County's trout fishing streams, always listed first in comparison to the San Lorenzo and Soquel with their industrially-fouled waters. In 1906 the San Vicente was showing the effects of being launched into the Industrial Age: *"The San Vicente Creek, beloved of the angler and the artist, has its mouth stopped by a vast dyke, and its throat choked into a tunnel, a saloon on its border, and its bed for miles denuded of the granite cobbles and sand beds. A sawmill is swiftly cutting out the timber and dirt and debris defile the pools and clog the riffles where lurked the gamey trout."* (*Surf* 2/02/1906)

Comparisons

Because there were no trestle-fill ramparts on the immediate coast north of Davenport, there are two beaches within the Coast Dairies Property that provide comparisons with the railroad rampart beaches. The beach at Davenport Landing was visible and accessible from the old coast road and only disappeared from view when the highway was straightened in the 1950s. Scotts Creek Beach is visible and accessible to the public because the modern highway drops down onto the sand itself. Both of these beaches are well known to the public and heavily used.

The Railroad Cuts

A word must be said about the cuts through which the present-day railroad makes its way between Santa Cruz and Davenport. By any measure, they are huge. From base to base they still measure around 30 feet, reflecting the original plan to have three sets of broad gauge rails run through them. Between 1907 and 1923, when both the Southern Pacific and Ocean Shore operated along the coast, there were two sets of rails in operation, but now the Union Pacific's rails are centered in the cuts, running on a raised platform of gravel ballast. From all appearances, the width of the cuts and the raised tracks are relatively easy to maintain. What few landslides have occurred in the cuts have fallen harmlessly at their base, well away from the tracks themselves.

Effects on Fishing

After 1906 the fish that had migrated freely up and down the streams were channeled through tunnels and in some places confronted with new obstructions that they could not surmount. By default, after 1906, rampartless Scotts Creek became an extremely important North Coast stream, a fact that was recognized by the State Fish and Game Commission when it declared the lower section a fish refuge. Scotts Creek's importance as a center of fish propagation on the North Coast is yet another legacy of railroad landscaping down the coast.

In a remarkable description written in early 1906, Arthur Taylor wrote of the immediate effects that the Ocean Shore's cuts and fills were having on the North Coast: *"Enterprise has outraged Nature until the human heart must bleed in sympathy with her prostrate, mangled form. The fields where once the grain waved, the kine fed and the poppies spread over the uncultivated corners, are seamed and scarred and gashed; huge embankments as high as tree tops stretch across the canyons where they debouch into the ocean; and the coastwise brooks have all been ruthlessly taken out of their beds and driven through dark, gruesome tunnels. The alluring byroads and by-paths that led from the coast road across the fields to the Natural Bridge and its nearby beach, to Parson's beach to the little pebbly beach and the other cozy nooks along the shore have all been severed by strips of steel or gouged out by that cruel steam shovel."* (*Surf* 2/3/1906)

Hundreds of laborers worked into the fall of 1905, and when the railroad's first locomotive arrived in October, the movement of materials and men to the railhead went much more quickly. Heavy rains in early 1906 slowed the work, but it was the earthquake on April 18 that captured everybody's attention.

The 1906 Earthquake

The early morning earthquake on April 18 interrupted all the North Coast construction projects. The Southern Pacific lost not only its corporate offices in San Francisco, but also suffered extensive damage along its Central California routes. Perhaps the most daunting was the blockage of the huge tunnel through the Santa Cruz Mountains on its South Pacific Coast branch line. It would take the railroad three years to re-open that section to traffic. With all the other challenges facing the Southern Pacific, the North Coast branch to San Vicente was delayed.

The effect on the stretch of Ocean Shore working toward the cement plant site north of Santa Cruz was minimal. There was some settling of the trestle fill just south of Laguna, but as one observer noted, the earthquake combined with the previous heavy rains probably accelerated the settling process all along the line. Since the Southern Pacific had not yet begun to build northward from Santa Cruz, the Ocean Shore immediately resumed work because of the promise of a temporary monopoly.

Work on the segment of the Ocean Shore building south from San Francisco halted for a time after April 18, and the earthquake would eventually prove to be fatal to the plans of the Ocean Shore's two-track electric railroad from San Francisco to Santa Cruz. The Ocean Shore's investors were never able to recover from the effects of the earthquake and its aftermath, economic recession of 1907. Ultimately the deeper pockets of the Southern Pacific corporation would prevail.

The first passenger train from Santa Cruz to San Vicente ran on June 15, 1906 just two months after the earthquake. Taylor described the day: *"There was an odor of new-mown hay in the atmosphere, poppies spattered the wayside with their daytime starts, and the uplands were just commencing to show a tinge of the brown of the dry season, and the ocean lay alongside all the way—placid, without a murmur or even a monotone that could be heard a hundred yards. The locomotive still attracts the attention of cattle up the coast, and many horses resent its appearance…"*(*Surf* 6/15/1906) In less than twelve months the Ocean Shore railroad had built twelve miles of improbable track and bed, spanning gulches, cutting down hills and leveling out Father Crespí's "tiresome" North Coast. Regular passenger service did not begin until the summer of 1907, but during the intervening year the Ocean Shore locomotives hauled equipment and building materials to the cement plant that was rising alongside the San Vicente. Two immediate effects of the Ocean Shore railroad were an increase in the value of real estate all along its completed and proposed route, as well as an estimated 20 percent increase in land being used for agriculture.

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The Ocean Shore began working northward from San Vicente in October 1906, and to avoid a long trestle across the mouth of Scotts Creek, the railroad chose a route that followed the old coast road, running inland across Molino Creek and up the east side of Scotts Creek Valley. In October of 1907 the three-mile section between San Vicente and the junction of Scott and Little Creek was completed, and the construction crews departed for other projects while the railroad attempted to gather together enough funds to continue northward towards Waddell (*Surf*, 10/24/1906; 5/20/1907; 10/2/1907). One of the objectives of the Ocean Shore, were it completed between San Francisco and Santa Cruz, was to open the huge old-growth forests on the western slope of the Santa Cruz Mountains. The railroad estimated that over two billion board feet of lumber was standing in the canyons between San Francisco and San Vicente with over 700 million board feet in the watersheds of Waddell Creek, Scotts Creek, and the San Vicente (Wagner, 1974). Even if the railroad was not pushed northward beyond Scotts Creek, it was in a position to haul logs or lumber out of those canyons.

1.3.4 THE CEMENT PLANT AND THE QUARRY RAILROAD

Meanwhile, as the Ocean Shore was building its railroad to the San Vicente, the cement plant was rising on the treeless terrace. Using horses and an army of laborers, the San Francisco construction company of Healy and Tibbits leveled the site. The camp for the construction company was in the valley of the San Vicente upstream from the proposed Ocean Shore Railroad grade. Hauling granite from the creekbed and sand from the beach, the company made cement to build the factory. During a visit in February of 1906 Taylor described the rising cement factory "*a scene of extended walls, open arches and massive battlements* [that] *reminded one of pictures of ancient ruined cities*." (*Surf* 2/3/1906)

The 1906 earthquake may have been a problem for the Ocean Shore line, but it accelerated the demand for concrete construction. Brick and mortar construction was rendered unacceptable by the earthquake, and wooden buildings by subsequent fires, driving most architects toward what became known as "fireproof" concrete construction. Dingee and his associates worked toward the completion of the cement plant secure in the knowledge that there would be a strong market for Portland cement (see Photo 1-5, and Photos 3 through 11, Appendix 1.3). By the end of 1906, the plant was ready to begin limited operation, and six months later was producing 3,000 barrels of cement per day (*Surf* 8/14/1907).

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Courtesy RMC Pacific Materials, Davenport

Photo 1-5: Construction of the Santa Cruz Portland Cement Plant, View to the East, 1905

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The tough, dangerous work was done mostly by crews of Greek laborers brought in by Healy and Tibbits just for that purpose. Several hundred Greeks cut the road into the canyon wall undertaking what one official termed "the hardest class of work"(*Surf* 9/23/05). The San Vicente gave up the railroad grade grudgingly, and injuries to the workers were a daily occurrence. Boulders crushed arms and legs and there was a steady stream of injured men taken into Santa Cruz for care. Confronted with what, to them, were unpronounceable Greek names, the newspapers often reported the injuries simply by giving the number that the man wore on his overalls: *"Two Greeks injured by falling rocks. Greek No. 573 and Greek No. 25, employed at the Santa Cruz Portland cement quarry, were treated lately by Dr. P.T. Phillips for injuries received by falling rocks. These Greeks all have numbers, a brass tag around their necks distinguishing them. No 573 received the most severe injury and had his leg badly cut open and No. 25 had his collar bone broken."* (*Surf* 12/2/1907)

Courtesy RMC Pacific Materials, Davenport

Photo 1-6: Construction of the Santa Cruz Portland Cement Company's Trestle No. 1, 1905

Simultaneously with all of the other construction, the quarry was opened and a huge rock crusher installed to knock the limestone and shale down to a uniform size. The stone was then hauled down to the cement plant on the railroad to be processed. Another large crew of Greeks worked in the quarry, and a small town named Bella Vista was built downstream from the quarry to house the workers. Arthur Taylor visited the town in 1910: *"The quarrymen's boarding house perches against the cliff like a swallow's nest under the eaves. It is stable-like in appearance, but as moss grows on the decaying log, sentiment clings to the human heart, and amid these desolate surroundings the Greek grub house is blazoned with the name of 'Bella Vista Hotel."* (*Surf* 8/1/1910) The irony of having a town with an Italian name housing Greek workers was not lost on Arthur Taylor.

1.3.5 THE ROLE OF COAST DAIRIES – THE COMPANY TOWN OF SAN VICENTE

Casual visitors often assume that the company town that grew up south of the cement plant belonged to the cement company, but it did not. Bella Vista and San Vicente, as well as all the supporting infrastructure for the cement operation, were owned and managed by Coast Dairies & Land Co. The Standard Portland Cement Company made cement; Coast Dairies did everything else.

The isolation that Dingee needed for his noisy, dusty industrial creation meant that all of those working on the plant and later employed in it would have to live nearby. In 1905, when the construction on the plant began, there was nothing nearby save the small community at Davenport Landing. So, under the guidance of Coast Dairies manager Louis Moretti, a town grew up on the slope between the cement plant and San Vicente Creek. Since most of the workers were single men, the main feature of the little town was its hotels. Eventually there were two hotels to house the workers, along with buildings to house the other businesses necessary to support the men. By 1908, the town had two hotels, a general store (known as the "cash store"), a post office, butcher shop, barber shop, blacksmith shop, livery stable, public hall and public school. The businesses were either managed directly by Moretti or fellow Swiss or Italian immigrants. Initially called San Vicente (or San Vicente-by-the-sea) in 1905 to distinguish the town from Davenport's Landing just up the coast, the town soon came to be known simply as Davenport, a name that everyone used by 1908.

In 1909, to provide the cement plant managers a place for their families to live that was away from the predominantly male culture of Davenport, Coast Dairies & Land Company laid out a small sixteen lot town on the north side of the factory. Skeptics also noted that the little subdivision was upwind from the cement plant and thus suffered less cement dustfall than the larger town to the south. Originally called Morettiville in honor of the manager of Coast Dairies, the town eventually came to be known as the "New Town" to distinguish it from the older Davenport, and today it has been shortened to NewTown (Clark, 1986; Orlando pers. comm., 2000).

The Coast Dairies & Land Co.

During the early decades of the twentieth century, the company continued to operate five distinct dairies on their property, with an aggregate total of about 800 cattle. The progressive impulses that the company exhibited in its relationship with the cement plant were also evident in the dairy business. In 1902 they opened a direct-to-the-consumer retail outlet in downtown Santa Cruz with the most modern equipment fully visible through windows facing Pacific Avenue. However, selling butter and cheese in San Francisco supported the bulk of their business, and the completion of the Ocean Shore Railroad brought convenient transportation for their products (although "convenient" in North Coast terms meant via Santa Cruz). The company also raised hay and other farm products, in addition to renting the groves at Laguna and Liddell for picnics.

1.3.6 THE LAST EXTRACTION: THE SAN VICENTE LUMBER COMPANY

The cement plant, quarry and attendant railroad weren't quite enough to satisfy the turn-of-the-century entrepreneurial spirit, and there is still one more industrial story line to emerge from events early in the twentieth century. In the late 1890s, the Santa Cruz Lime Company purchased approximately 7,500 acres immediately upstream on the San Vicente from the land owned by Louis Moretti. The company then built and operated a lime kiln on the San Vicente and freighted their finished product down the creek and over to the old Davenport Landing. Not long

after purchasing the site for their cement plant from Coast Dairies, the Standard Portland Cement Company purchased the entire property and kiln operation from Santa Cruz Lime, and it was there (adjacent to the current Coast Dairies Property) that they then established the limestone quarry for the cement plant (*Surf* 8/15/1906). William Dingee was not in the lumber business, however, and in 1907 he sold the timber rights (but not the land itself) to a group of Mormon lumbermen from Salt Lake City. By the spring of 1908 the group was incorporated as the San Vicente Lumber Company and had purchased a total of 16,000 acres of timber rights in the upper San Vicente and Scotts Creek drainages (Hamman, 1980).

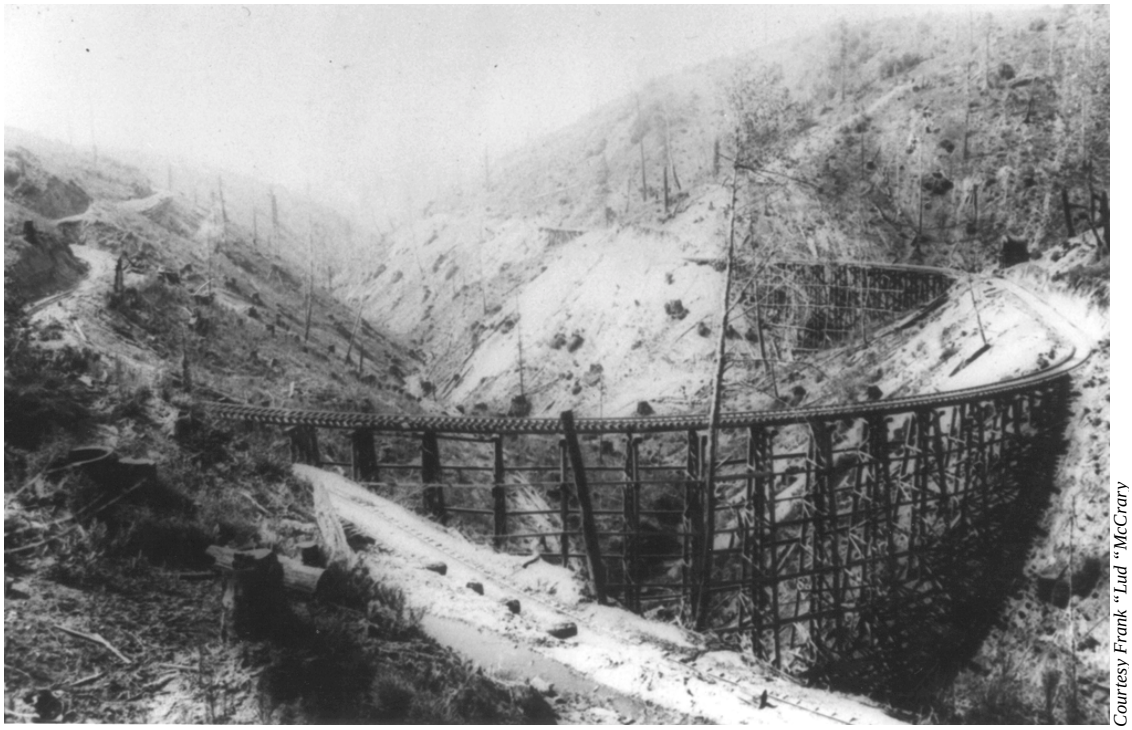
Blocked by the cement plant limestone quarry from access to the upper San Vicente, the San Vicente Lumber Co. used the Scotts Creek-Little Creek drainages as their access, coming around to the timber from the northwest. The company then decided to locate their mill on the northern edge of Santa Cruz beside Moore's Creek, and after some wrangling with the town council they received the necessary permission and began building the largest lumber mill in the history of the county. The mill had a daily capacity of 70,000 board feet. Moore's Creek was dammed to create their millpond (today's Antonelli's pond).

Over the next 14 years, the San Vicente Lumber Company built over nine miles of broad gauge railroad into the mountains behind Davenport, felled the trees and brought the logs down to their Santa Cruz mill on the Ocean Shore Railroad. The grades and switchbacks that enabled the San Vicente railroad to achieve 1,400-foot elevation rise were breathtaking, and would be even in 2001. In some places the railroad grade reached eight percent. Since the winter rainfall on that side of Ben Lomond Mountain could be prodigious at times, few of the long, spider-web trestles were ever filled in. It has been estimated that the San Vicente Lumber Company cut over 400 million board feet of lumber before it ceased operations in 1923 (Hamman, 1980). Several other timber operations worked smaller areas during this time, including the Loma Prieta Lumber Company that started a relatively small operation on Mill Creek in 1907. Since the Loma Prieta had a mill on site, they shipped finished lumber out on the Ocean Shore Railroad, while the San Vicente shipped raw logs (*Surf* 1/14/1907) (see Photo 1-7).

1.3.7 SANTA CRUZ NEEDS MORE WATER

The dry winters of 1897-1898 and 1898-1899, plus increased silt build up in Santa Cruz's Laguna Creek water system, compelled the city to undertake a series of studies between 1903 and 1912 to find an alternative or supplemental source of water.

Arthur Taylor, whose observations we have quoted before, was something of an amateur hydrologist and over the years he explored a number of North Coast streams and reported about those explorations in his newspaper, the *Surf*. In 1903 he wrote a series of articles describing the shortcomings of the Laguna Creek system. In one article he told of standing above the Laguna Dam and looking upstream: *"From this point there is little timber in sight above the dam on the Laguna and for some distance, half a mile or more the canyon is quite broad and open. Beyond the canyon sides rise from fifty to two hundred feet above the bed of the brook and are tolerably*



Courtesy Frank "Lud" McCrary

Photo 1-7: San Vicente Logging Company

well covered by second growth redwood and pine, with about the average amount of shrubbery.." (*Surf* 11/10/1903) The upstream logging had taken its toll on the ability of Laguna Creek to provide water to the city system:

"There is very little tall timber left on any part of the Laguna, but the channel of the stream is choked and filled in many places with huge masses of debris, left by the lumbermen and the woodchopper, and which in times of high water has floated down stream and lodged at convenient and inconvenient spots. Fire has swept over much of this, and in other places the redwood timber is lying in the bed of the brook and slowly decaying...The site of the old Grover Sawmill, is a sorry sight. There is a mass of badly burned, broken, tangled timbers, and a huge pile of sawdust still left by the bank, gradually decaying and percolating into the stream. From the mill site coastward the fall is more rapid, the banks crowd each closely, and big boulders, clog the channel..." (*Surf* 11/16/1903)

Taylor had heard of a famous spring on Liddell Creek, but had never seen it. One day he met Louis Moretti, the manager of the Coast Dairies Property, on the street in Santa Cruz and asked him if the spring was as big as it was rumored to be. Moretti said yes and offered to take Taylor on a guided tour. Taylor's first sighting of the spring was an epiphany: *"...Would to God, I could share with every citizen the thrill of joy which was felt when I caught sight of that huge volume of water gushing, bubbling, pouring out of this spring hundreds of gallons per minute."* (*Surf* 11/14/1903)

It took another nine years for the city to share Taylor's joy about the spring, but finally, after several more studies, the city purchased the spring from Coast Dairies & Land Co. for $20,000 (*Surf* 12/24/1912). By early 1913, the spring's estimated daily flow of 950,000 gallons was added to the city water system, and in the following winter it was noted that when Laguna Creek's water was muddy as it entered the city system, the water from the spring flowed crystal clear (*Surf*, 1/28/1914). The Liddell spring at Laguna Creek continues to be a part of the Santa Cruz City water system to this day, providing 20 percent of the city's supply.

In a recent interview, Robert Bosso, long-time attorney for Coast Dairies and past president of the corporation, discussed the impact of the 1912 sale of the spring on the later history of the Coast Dairies Property: "I'm sure that Moretti and Respini thought they were getting a good price for the spring in 1912, but we sure could have used that water later on. That spring is priceless." (Bosso pers. comm., 2000)

1.3.8 THE SWISS RETURN TO SWITZERLAND

It has been estimated that well over half of all the European immigrants who came to the United States returned to their native countries (Takaki, 1993), so the fact that the Swiss owners of the Coast Dairies & Land Company went back to Switzerland is not unusual as such. What made it curious was that they had been so successful during the decades they lived in Santa Cruz County. A number of theories have been advanced over the years about why the Moretti and Respini families returned home, but Robert Bosso was told that the Swiss returned to Switzerland to avoid costly penalties, should they be drafted into the United States military. According to the Moretti descendants in Switzerland, Swiss law, based on that nation's firm notions of neutrality, forbade Swiss nationals from participating in another country's military, and if they did, they faced stiff financial penalties should they ever return home. As the war in Europe heated up after 1914, it appeared that the United States might become involved and, once it did, that a draft might be instituted. Thus, according to Bosso, the Swiss returned to avoid being drafted into the United States military, with the loss of what had, until then, been virtual dual citizenship (Bosso, pers. comm., 2000).

The most poignant departure was that of Mr. and Mrs. Louis Moretti in the summer of 1915. Without question, Moretti had been the energy and vision behind the industrial revolution on the North Coast. Moretti stayed until the dedication of his last project—the concrete Catholic chapel on the knoll above San Vicente Creek, in May of 1915. The church can be seen not only as a symbol of the cooperation between Coast Dairies, the cement company, and the community, but also as a personal legacy of Louis Moretti himself. He designed the church to replicate the churches he had seen as a young man around his native Locarno, and it was fitting that he would leave that symbol of Switzerland before he went home (*Surf* 5/17/1915). The landmark chapel still stands today on Church Street in Davenport (see Photo 1-8).

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Photo 1-5: Construction of the Santa Cruz Portland Cement Plant, View to the East, 1905

If the work the Ocean Shore Railroad was doing with its trestles and fills along the coast was impressive, the broad gauge railroad laid up the San Vicente Canyon to the limestone quarry site was almost equally so. The "snake-like" railroad was cut into three miles of the north wall of the canyon. The grade required almost continual blasting, and in one impressive instance, rocks thrown by an 8,000-pound blast landed over three miles away from the explosion. The cement company built eight trestles to bridge side canyons along the way, with one 300 feet long and 137 feet above the canyon floor (see Photo 1-6) (*Surf* 12/11/1905).

The tough, dangerous work was done mostly by crews of Greek laborers brought in by Healy and Tibbits just for that purpose. Several hundred Greeks cut the road into the canyon wall undertaking what one official termed "the hardest class of work"(*Surf* 9/23/05). The San Vicente gave up the railroad grade grudgingly, and injuries to the workers were a daily occurrence. Boulders crushed arms and legs and there was a steady stream of injured men taken into Santa Cruz for care. Confronted with what, to them, were unpronounceable Greek names, the newspapers often reported the injuries simply by giving the number that the man wore on his overalls: *"Two Greeks injured by falling rocks. Greek No. 573 and Greek No. 25, employed at the Santa Cruz Portland cement quarry, were treated lately by Dr. P.T. Phillips for injuries received by falling rocks. These Greeks all have numbers, a brass tag around their necks distinguishing them. No 573 received the most severe injury and had his leg badly cut open and No. 25 had his collar bone broken."* (*Surf* 12/2/1907)

Courtesy RMC Pacific Materials, Davenport

Photo 1-6: Construction of the Santa Cruz Portland Cement Company's Trestle No. 1, 1905

Simultaneously with all of the other construction, the quarry was opened and a huge rock crusher installed to knock the limestone and shale down to a uniform size. The stone was then hauled down to the cement plant on the railroad to be processed. Another large crew of Greeks worked in the quarry, and a small town named Bella Vista was built downstream from the quarry to house the workers. Arthur Taylor visited the town in 1910: *"The quarrymen's boarding house perches against the cliff like a swallow's nest under the eaves. It is stable-like in appearance, but as moss grows on the decaying log, sentiment clings to the human heart, and amid these desolate surroundings the Greek grub house is blazoned with the name of 'Bella Vista Hotel."* (*Surf* 8/1/1910) The irony of having a town with an Italian name housing Greek workers was not lost on Arthur Taylor.

1.3.5 THE ROLE OF COAST DAIRIES – THE COMPANY TOWN OF SAN VICENTE

Casual visitors often assume that the company town that grew up south of the cement plant belonged to the cement company, but it did not. Bella Vista and San Vicente, as well as all the supporting infrastructure for the cement operation, were owned and managed by Coast Dairies & Land Co. The Standard Portland Cement Company made cement; Coast Dairies did everything else.

The isolation that Dingee needed for his noisy, dusty industrial creation meant that all of those working on the plant and later employed in it would have to live nearby. In 1905, when the construction on the plant began, there was nothing nearby save the small community at Davenport Landing. So, under the guidance of Coast Dairies manager Louis Moretti, a town grew up on the slope between the cement plant and San Vicente Creek. Since most of the workers were single men, the main feature of the little town was its hotels. Eventually there were two hotels to house the workers, along with buildings to house the other businesses necessary to support the men. By 1908, the town had two hotels, a general store (known as the "cash store"), a post office, butcher shop, barber shop, blacksmith shop, livery stable, public hall and public school. The businesses were either managed directly by Moretti or fellow Swiss or Italian immigrants. Initially called San Vicente (or San Vicente-by-the-sea) in 1905 to distinguish the town from Davenport's Landing just up the coast, the town soon came to be known simply as Davenport, a name that everyone used by 1908.

In 1909, to provide the cement plant managers a place for their families to live that was away from the predominantly male culture of Davenport, Coast Dairies & Land Company laid out a small sixteen lot town on the north side of the factory. Skeptics also noted that the little subdivision was upwind from the cement plant and thus suffered less cement dustfall than the larger town to the south. Originally called Morettiville in honor of the manager of Coast Dairies, the town eventually came to be known as the "New Town" to distinguish it from the older Davenport, and today it has been shortened to NewTown (Clark, 1986; Orlando pers. comm., 2000).

The Coast Dairies & Land Co.

During the early decades of the twentieth century, the company continued to operate five distinct dairies on their property, with an aggregate total of about 800 cattle. The progressive impulses that the company exhibited in its relationship with the cement plant were also evident in the dairy business. In 1902 they opened a direct-to-the-consumer retail outlet in downtown Santa Cruz with the most modern equipment fully visible through windows facing Pacific Avenue. However, selling butter and cheese in San Francisco supported the bulk of their business, and the completion of the Ocean Shore Railroad brought convenient transportation for their products (although "convenient" in North Coast terms meant via Santa Cruz). The company also raised hay and other farm products, in addition to renting the groves at Laguna and Liddell for picnics.

1.3.6 THE LAST EXTRACTION: THE SAN VICENTE LUMBER COMPANY

The cement plant, quarry and attendant railroad weren't quite enough to satisfy the turn-of-the-century entrepreneurial spirit, and there is still one more industrial story line to emerge from events early in the twentieth century. In the late 1890s, the Santa Cruz Lime Company purchased approximately 7,500 acres immediately upstream on the San Vicente from the land owned by Louis Moretti. The company then built and operated a lime kiln on the San Vicente and freighted their finished product down the creek and over to the old Davenport Landing. Not long

after purchasing the site for their cement plant from Coast Dairies, the Standard Portland Cement Company purchased the entire property and kiln operation from Santa Cruz Lime, and it was there (adjacent to the current Coast Dairies Property) that they then established the limestone quarry for the cement plant (*Surf* 8/15/1906). William Dingee was not in the lumber business, however, and in 1907 he sold the timber rights (but not the land itself) to a group of Mormon lumbermen from Salt Lake City. By the spring of 1908 the group was incorporated as the San Vicente Lumber Company and had purchased a total of 16,000 acres of timber rights in the upper San Vicente and Scotts Creek drainages (Hamman, 1980).

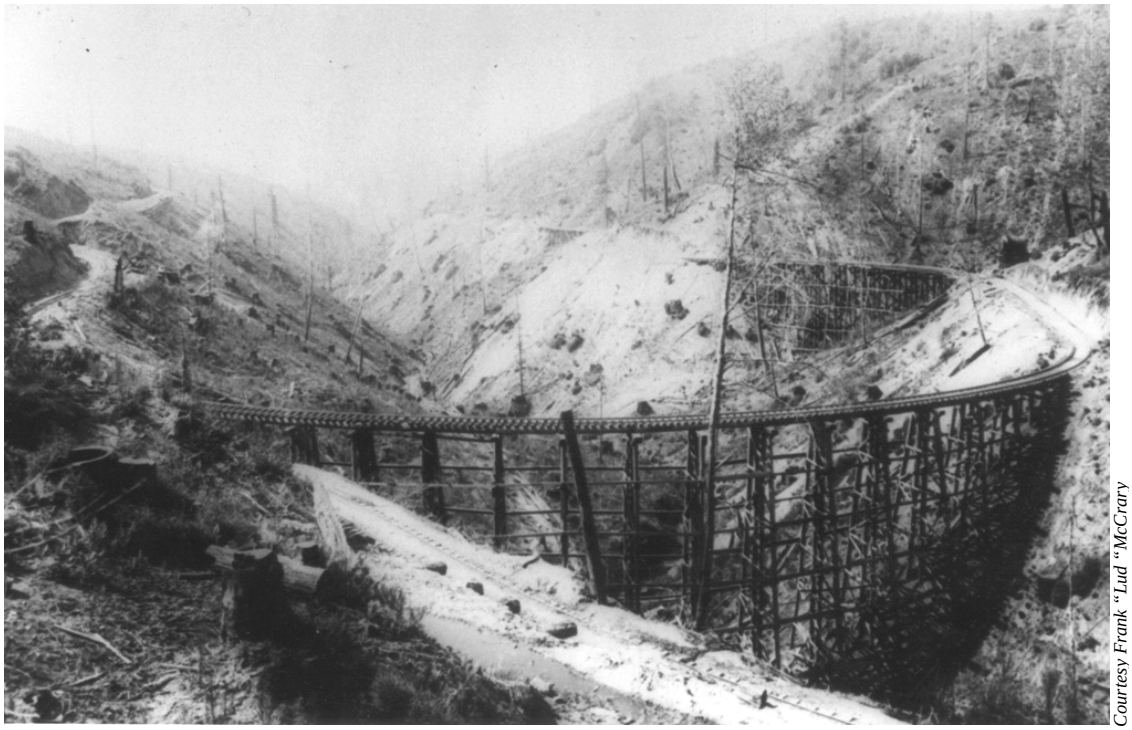
Blocked by the cement plant limestone quarry from access to the upper San Vicente, the San Vicente Lumber Co. used the Scotts Creek-Little Creek drainages as their access, coming around to the timber from the northwest. The company then decided to locate their mill on the northern edge of Santa Cruz beside Moore's Creek, and after some wrangling with the town council they received the necessary permission and began building the largest lumber mill in the history of the county. The mill had a daily capacity of 70,000 board feet. Moore's Creek was dammed to create their millpond (today's Antonelli's pond).

Over the next 14 years, the San Vicente Lumber Company built over nine miles of broad gauge railroad into the mountains behind Davenport, felled the trees and brought the logs down to their Santa Cruz mill on the Ocean Shore Railroad. The grades and switchbacks that enabled the San Vicente railroad to achieve 1,400-foot elevation rise were breathtaking, and would be even in 2001. In some places the railroad grade reached eight percent. Since the winter rainfall on that side of Ben Lomond Mountain could be prodigious at times, few of the long, spider-web trestles were ever filled in. It has been estimated that the San Vicente Lumber Company cut over 400 million board feet of lumber before it ceased operations in 1923 (Hamman, 1980). Several other timber operations worked smaller areas during this time, including the Loma Prieta Lumber Company that started a relatively small operation on Mill Creek in 1907. Since the Loma Prieta had a mill on site, they shipped finished lumber out on the Ocean Shore Railroad, while the San Vicente shipped raw logs (*Surf* 1/14/1907) (see Photo 1-7).

1.3.7 SANTA CRUZ NEEDS MORE WATER

The dry winters of 1897-1898 and 1898-1899, plus increased silt build up in Santa Cruz's Laguna Creek water system, compelled the city to undertake a series of studies between 1903 and 1912 to find an alternative or supplemental source of water.

Arthur Taylor, whose observations we have quoted before, was something of an amateur hydrologist and over the years he explored a number of North Coast streams and reported about those explorations in his newspaper, the *Surf*. In 1903 he wrote a series of articles describing the shortcomings of the Laguna Creek system. In one article he told of standing above the Laguna Dam and looking upstream: *"From this point there is little timber in sight above the dam on the Laguna and for some distance, half a mile or more the canyon is quite broad and open. Beyond the canyon sides rise from fifty to two hundred feet above the bed of the brook and are tolerably*



Courtesy Frank "Lud" McCrary

Photo 1-7: San Vicente Logging Company

well covered by second growth redwood and pine, with about the average amount of shrubbery.." (*Surf* 11/10/1903) The upstream logging had taken its toll on the ability of Laguna Creek to provide water to the city system:

"There is very little tall timber left on any part of the Laguna, but the channel of the stream is choked and filled in many places with huge masses of debris, left by the lumbermen and the woodchopper, and which in times of high water has floated down stream and lodged at convenient and inconvenient spots. Fire has swept over much of this, and in other places the redwood timber is lying in the bed of the brook and slowly decaying...The site of the old Grover Sawmill, is a sorry sight. There is a mass of badly burned, broken, tangled timbers, and a huge pile of sawdust still left by the bank, gradually decaying and percolating into the stream. From the mill site coastward the fall is more rapid, the banks crowd each closely, and big boulders, clog the channel..." (*Surf* 11/16/1903)

Taylor had heard of a famous spring on Liddell Creek, but had never seen it. One day he met Louis Moretti, the manager of the Coast Dairies Property, on the street in Santa Cruz and asked him if the spring was as big as it was rumored to be. Moretti said yes and offered to take Taylor on a guided tour. Taylor's first sighting of the spring was an epiphany: *"...Would to God, I could share with every citizen the thrill of joy which was felt when I caught sight of that huge volume of water gushing, bubbling, pouring out of this spring hundreds of gallons per minute."* (*Surf* 11/14/1903)

It took another nine years for the city to share Taylor's joy about the spring, but finally, after several more studies, the city purchased the spring from Coast Dairies & Land Co. for $20,000 (*Surf* 12/24/1912). By early 1913, the spring's estimated daily flow of 950,000 gallons was added to the city water system, and in the following winter it was noted that when Laguna Creek's water was muddy as it entered the city system, the water from the spring flowed crystal clear (*Surf*, 1/28/1914). The Liddell spring at Laguna Creek continues to be a part of the Santa Cruz City water system to this day, providing 20 percent of the city's supply.

In a recent interview, Robert Bosso, long-time attorney for Coast Dairies and past president of the corporation, discussed the impact of the 1912 sale of the spring on the later history of the Coast Dairies Property: "I'm sure that Moretti and Respini thought they were getting a good price for the spring in 1912, but we sure could have used that water later on. That spring is priceless." (Bosso pers. comm., 2000)

1.3.8 THE SWISS RETURN TO SWITZERLAND

It has been estimated that well over half of all the European immigrants who came to the United States returned to their native countries (Takaki, 1993), so the fact that the Swiss owners of the Coast Dairies & Land Company went back to Switzerland is not unusual as such. What made it curious was that they had been so successful during the decades they lived in Santa Cruz County. A number of theories have been advanced over the years about why the Moretti and Respini families returned home, but Robert Bosso was told that the Swiss returned to Switzerland to avoid costly penalties, should they be drafted into the United States military. According to the Moretti descendants in Switzerland, Swiss law, based on that nation's firm notions of neutrality, forbade Swiss nationals from participating in another country's military, and if they did, they faced stiff financial penalties should they ever return home. As the war in Europe heated up after 1914, it appeared that the United States might become involved and, once it did, that a draft might be instituted. Thus, according to Bosso, the Swiss returned to avoid being drafted into the United States military, with the loss of what had, until then, been virtual dual citizenship (Bosso, pers. comm., 2000).

The most poignant departure was that of Mr. and Mrs. Louis Moretti in the summer of 1915. Without question, Moretti had been the energy and vision behind the industrial revolution on the North Coast. Moretti stayed until the dedication of his last project—the concrete Catholic chapel on the knoll above San Vicente Creek, in May of 1915. The church can be seen not only as a symbol of the cooperation between Coast Dairies, the cement company, and the community, but also as a personal legacy of Louis Moretti himself. He designed the church to replicate the churches he had seen as a young man around his native Locarno, and it was fitting that he would leave that symbol of Switzerland before he went home (*Surf* 5/17/1915). The landmark chapel still stands today on Church Street in Davenport (see Photo 1-8).

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Courtesy Covello and Covello, Santa Cruz

Photo 1-8: Davenport, with a Coating of Cement Dust, The Chapel Stands in the Right Background, 1965

By 1920 the shareholders of the Coast Dairies & Land Company were all back in Switzerland, and the property was being managed by local employees of the corporation. The departure of the Coast Dairies leadership and the closing of the San Vicente Lumber Company in 1923 marked the end of a remarkable 20 years of industrial activity. The Santa Cruz Portland Cement Company continued to operate, but the emphasis in the region turned once again to agriculture.

1.3.9 THE EFFECT OF THE RAILROAD ON NORTH SHORE AGRICULTURE

As we have seen, the Ocean Shore and Southern Pacific Railroads had a profound effect on North Coast industrial development. The effects on agriculture came more slowly, but were no less transformative. The keys to the development of the twentieth century crops that are most identified with the North Coast—artichokes and Brussels sprouts—were refrigeration, dependable seasonal farm labor, and the development of national and international markets.

Artichokes

Artichokes were the first major specialty crop in the agricultural revolution on the North Coast. Though there is considerable debate about who was the first to grow artichokes on the Central California Coast, it seems that they were first grown in large quantities in San Mateo County on the coastal terrace south of Pescadero Creek. The following newspaper item appeared in the *Surf* in March of 1916: *"F.H. Widemann of Pescadero has been here en route to King City. He has charge of the 10,000 acre Coburn ranch at Pescadero and has 1,000 acres in artichokes which are grown for the San Francisco and eastern market. The rest of the ranch is in beans and timber…Mr. Widemann states that artichokes are being grown in vast quantities there and that the entire country from Pescadero to Bean Hollow has been utilized for them and vegetables. It is now all irrigated from the Butano Creek…"* (*Surf* 3/10/1916)

Another source indicates that Mr. A.E. Morelli first grew a small plot of artichokes near Davenport in that same year (Watkins 1925). Regardless of who was first, by 1919, local resident Tom Majors attested to there being 600 acres of artichokes under cultivation between Santa Cruz and Davenport: *"At present there are about 600 acres leased to Italian vegetable men, along the coast between Santa Cruz and Davenport. About 100 acres on the Charles B. Younger ranch, 120 acres on the Pio Scaroni ranch, 120 acres on the Majors Brothers ranch and about 250 acres by the Coast Dairies & Land Co. These Italian gardeners find that the soil and climate are very well adapted to the raising of this fruit or vegetable. The artichoke plant wants a climate not too hot and not too cold, and the coast salt air keeps them free from bugs and lice…The Italian vegetable men are splendid gardeners, and very industrious workers. Besides the artichokes they raise peas, potatoes, Brussels sprouts, cabbage and other vegetables. The artichokes will be raised and shipped in carload lots from Godola or Majors station direct to Chicago and New York City, where they are selling at present for $5 per box, consisting of three and one-half dozen in a box which goes to show that the artichoke business is all right when once established."*(Surf 1/18/19)

The use of refrigerator cars for shipping vegetables long distances accelerated during World War I, and by 1920 several processing and packing sheds were established on the west side of Santa Cruz to handle the increasing amounts of produce being grown on the North Coast. A major Santa Clara County packing company built a cannery near Pigeon Point to handle produce coming from the Pescadero area in 1917 (*Sentinel* 4/8/1917). By the early 1920s the artichoke acreage began to spread southward onto the coastal terraces around Aptos and Castroville. Artichokes were enough of a commodity in Santa Cruz County that a 1923 newspaper article listed them among the three major agriculture products, the other two being apples and poultry (*Sentinel* 2/8/23).

Artichokes and Brussels sprouts are "niche" vegetables, and the markets are those places in the United States where large numbers of Southern Europeans have settled, particularly Chicago and the Northeast, or Europe itself. According to Ron Tyler, Farm Advisor emeritus of Santa Cruz County, the aging of the European immigrant community (and its replacement by immigrants from Asia and Latin America) has softened the market for both, particularly Brussels sprouts (see Appendix 1.2.4).

Farm Laborers

As the acreage of artichokes and other vegetables grew along the North Coast, so did the need for agricultural laborers. Filipino and Mexican farm laborers were the mainstay of the agricultural workforce on the North Coast from the 1930s well into the 1960s, and there are still several farm labor buildings located on the Coast Dairies Property that once housed Filipinos. Several informants specifically noted that the red-colored buildings on the ocean side of Highway 1 just south of Yellow Bank Creek once housed Filipino farm laborers.

The Dairies Decline

The North Coast dairies continued to do very well financially during the 1920s, but the coming of the Depression in the 1930s, coupled with new regulatory legislation, began to make it increasingly difficult to operate dairies on the coast. A 1938 law required testing of all dairy cattle for tuberculosis and the California Department of Agriculture's stringent sanitary inspections eventually put many of the North Coast Dairies out of business (Weldon, 1986).

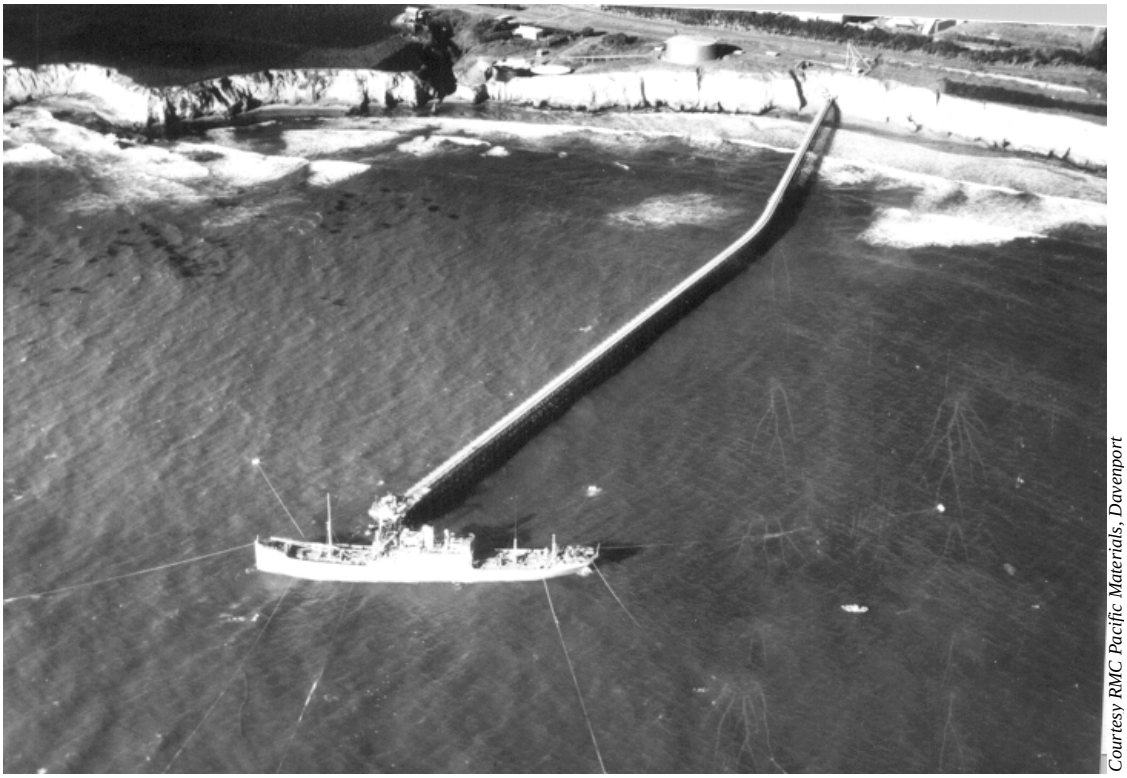
Santa Cruz Portland Cement Company Pier – 1934

The one major exception to a North Coast economic downturn during the 1930s was an expansion of the cement plant at an estimated cost of $1.5 million. Even with its dependable Southern Pacific Railroad connection, the cement company continued to chafe at its inability to get its product out to market. Finally, after studying all the possibilities, the company decided to build a pier out from the bluff adjacent to the factory and pump dry cement into a ship anchored off shore. The cement company, which had thrown all of its technological muscle into operations at Ben Lomond Mountain, now turned toward the sea. In light of all the failed efforts to set up shipping facilities on the North Coast, it was an audacious plan. The cement was to be stored in a nest of silos atop the bluff. A massive compressor would then suck the cement down through a huge tunnel and into two twelve-inch pipes and out along a half-mile pier into the waiting ship.

The key to the plan was the pier. As no pier on the North Coast had ever weathered a winter season without being ripped apart, it could not be of traditional wooden construction. It was to be a metal pier with its steel pilings driven deep into the coastal bedrock. All the joints were to be welded, and the pier's end was anchored with huge concrete-filled caissons also driven deep into the ocean floor. Construction of the pier began in December 1933, and during the winter of 1933-34 the ocean tested construction and design, with waves in excess of thirty feet. On several occasions the massive swells swatted the pile driver into the sea, but the construction continued until, in early October 1934, it was completed. Extending 2,327 feet into the sea, it was the first all-welded steel pier built on the Pacific Coast.[21]

[21] Company officials believed it to be the first all-welded steel pier in the world.

The company purchased a 400-foot freighter, aptly renamed it *Santacruzcement*, and on October 16, 1934, sent the first load of 45,000 barrels of cement to a special silo farm in Stockton (*Sentinel* 10/17/1934). The ship continued to carry cement from the plant into the 1950s, until the coast road was improved enough that trucks could take over transporting the company's product. Today, 67 years after the pier was built, several of the steel piers still defy the ocean off the Davenport bluff, marking one of the most brazen efforts to thwart the power of the ocean[22] (see Photograph 1-9).



Courtesy RMC Pacific Materials, Davenport

Photo 1-9: The Ship *Santacruzcement* Anchored off Davenport, Possibly 1940s

Concerns About Cement Dust

One of the local signatures of the cement plant at Davenport was the coating of dust that radiated out from the plant onto the surrounding countryside. Since the prevailing wind came from the north and northwest, the dust was thickest on the hills and fields south of the plant, but there was enough wind variation to cast all of the immediate vicinity in a gray shroud of dust. Houses, cars and buildings were all coated with the dust, and over the years there had been numerous complaints about the effects of the dust on the local agricultural community. The fact that the cement plant was the major employer in the area made it difficult for many local citizens to complain, but in 1935, a coalition of local farmers and ranchers organized to "*force the Santa Cruz Portland Cement Company to eliminate the causes of damage to the coast field crops by the*

[22] It is interesting to note that another similar ocean-defying monument, the "Cement Ship" *Palo Alto* that was sunk off Seacliff Beach (Santa Cruz County) in 1930 was built of Davenport cement.

cement dust." Twelve growers filed suit against the cement plant and they were joined by 42 more growers and dairymen (*Sentinel* 3/28/1935).

One of the complaints came from those raising dairy cows and cattle on the North Coast. Range animals that ate large amounts of the dust "did not develop properly" according to one animal husbandry expert working in the University of California Extension office at the time. "They just looked skinny and didn't put on any weight." The University of California at Davis sent a number of scientists to the North Coast to study the matter, but results were not conclusive (Lydon pers. comm., 2000). The suit against the cement company worked its way through the court system for many years.

In 1955, Davenport residents gathered in a public meeting to air their complaints about the dust. Many of those that testified brought exhibits to demonstrate just how pervasive the dust was, including a cross-section of lawn showing that the dust penetrated six inches into the earth. One auto mechanic brought a fifteen-pound bag of cement dust that he had collected in just one day while servicing the dust-covered automobiles of Davenport residents. Residents complained of being unable to get the family laundry clean, and one testified that they could not keep a television set because the dust always seeped into the cabinet and shorted it out (*Sentinel* 3/18/1955). Several dozen lawsuits were filed against the company following the meeting (see Photo 1-10).

Courtesy RMC Pacific Materials, Davenport

Photo 1-10: Cement plant, Pier and Dust, View to the Southwest, Date Unknown

Eventually, after the cement plant changed hands, all of the suits were settled out of court in 1961 and the company agreed to install equipment to minimize the dust emissions (Koch, 1973).

1.4 INTO THE PRESENT

The Davenport cement plant (it became Pacific Cement and Aggregates in 1956, Lonestar Cement Corporation in 1965 and RMC Pacific Materials in 1988), brought immediate military attention to the North Coast following the attack on Pearl Harbor in December 1941. Believing that Japan might attack the U.S. mainland, the military quickly posted guards and lookouts around Davenport and imposed stringent blackout requirements on its residents. Later in December, when the ship *Agiworld* was attacked by a Japanese submarine off Cypress Point south of Monterey, security along the coast was heightened (Lydon, 1997). A Japanese submarine was also sighted off the coast a few miles north of Davenport, resulting in a brief skirmish between the submarine and a single plane from the Army Air Corps (Lud McCrary Interview, Appendix 1.2.1). Eventually a segment of the all-black 54th Coast Artillery was stationed at Davenport and regular night canine patrols were instituted at all the area beaches. In addition, four shore mounted guns were placed strategically around the Cement Plant. Two 75mm guns were mounted overlooking the pier and two 155mm Howitzers were mounted just to the east of NewTown. Many of the young people living in the area at the time became airplane spotters, spending long hours in the lookout stations posted along the coastal hills (see Appendices 1.2.2 and 1.2.4, McCrary and Tomares Interview) (see Photo 1-11).

Courtesy Gianoni Family

Photo 1-11: World War II Observation Post above NewTown

Perhaps the most disruptive part of the early months of the war was the removal of many Italians from the coast, along with all persons of Japanese ancestry. Beginning in February of 1942, all Italian aliens living inland from Highway 1 south of Laguna Creek were required to move inland from the highway, and since many of the Italian families living on the North Coast had elderly unnaturalized parents and grandparents, the military orders brought extreme hardships to the farmers between Laguna Creek and the city limits of Santa Cruz. For the few families of

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Japanese present since the 1920s, the removal from the North Coast to a concentration camp in Arizona was devastating. Very few of the Japanese returned to the North Coast after the war.

Taking the Loops Out of Highway 1

During the 1920s and 1930s Californians developed their definite and persistent preference for automobile transportation over rail, and ridership began to decline on Santa Cruz County railroads. As truck and automobile traffic increased, the North Coast retreated back into its pre-railroad isolation, the meandering and dangerous Coast Road keeping out all but the most adventurous drivers. World War II interrupted the plans by the state of California to straighten out Highway 1 through the North Coast, but by the late 1950s, the various segments of the highway were realigned and the curves that used to loop back into each of the canyons became secondary roads, or in some cases, private roads with gates at both ends.

The realignment of Highway 1 both in Santa Cruz County and San Mateo County cut many minutes off the drive from Santa Cruz to Half Moon Bay. Continuing work on the Waddell bluff made it more passable, and by the late 1950s, Highway 1 had its current alignment.

Coast Dairies & Land Co. as Absentee Landlord

Under the management of Swiss-born Fred Pfyffer, the Coast Dairies & Land Company continued to lease its various ranches for livestock and agriculture. Income from the Property made it self-sustaining, but the profit sent back to the Swiss owners was never large, rarely exceeding $100,000 per year. According to Robert Bosso, there were two main reasons that the property continued to be managed as a single entity. First, the fact that it was structured as a corporation. As such, it was difficult to sell the property piecemeal; the options that were negotiated from the 1960s on were attached to the entire property. Corporate ownership also made the tax consequences of selling the land separately very costly. Proceeds would be taxed twice – first at the corporate level and second as personal income for the owners. Thus, any sale would have to involve the entire corporation, reducing the tax burden to just one event. Second, the fact that the owners all lived in Switzerland meant that negotiations of options and the sale of the Property had to involve all the owners (seven in 1998), and all this, exacerbated by the distance, made selling the Coast Dairies Property something of a challenge.

The owners were quite willing to entertain options on the Property, however, and the first came from the oil companies that returned to prowl Santa Cruz County looking to develop the oil that was certainly beneath the ground (Bosso pers. comm., 2000).

The Second Oil Boom

There had been periodic oil flurries along the North Coast (following the one discussed earlier in this section), but by far the largest and most serious occurred in the 1950s when Shell Oil Company and Texaco negotiated several oil leases on the North Coast. In the mid-1950s, Texaco negotiated an oil lease with Coast Dairies to drill on the terrace near Davenport. Between June and December of 1956 Texaco drilled the deepest exploratory well in the history of Santa Cruz

County, probing 9,135 feet down. Though they found periodic evidence of oil and gas, it was insufficient to warrant further exploration. The well is known to geologists as Poletti #1, named for the family that was farming that particular section of Coast Dairies at the time (Griggs and Weber, 1990; Weber, 2000). Shell Oil drilled in a number of North Coast locations in the 1950s and 1960s, including on property owned by the cement company, and on land south of Laguna Creek.

The Coming of the University of California to Santa Cruz, 1964

Meanwhile, the wider context of Santa Cruz was being transformed by the opening of the University of California campus northwest of downtown. The university community quickly discovered the scenic beauty and relative solitude of the North Coast. University faculty members built homes in the Bonny Doon area, and the beaches and canyons became the de facto recreation area for the university. And with the university came an attitude toward development that was quite different from that held by some old-time Santa Cruz residents. The university set off a mini-housing boom on Santa Cruz's Westside, and developers began to plan large-scale housing projects along the open coastline.

The PG&E Nuclear Power Plant Proposal

In the late 1960s, Pacific Gas and Electric approached Coast Dairies and negotiated an option to purchase the property. PG&E's intent was to build a nuclear power plant on El Jarro Point on the terrace north of Davenport. This impulse was not unlike that followed by William Dingee in 1905 when he sought out the isolated reaches of the North Coast to locate an industrial operation unpopular with the people of Santa Cruz. In this instance, the public perception of nuclear power plants required that they be located in remote places-– Diablo Canyon in San Luis Obispo County, for example. PG&E's plan was to build a 6,000 megawatt generating facility on El Jarro Point and then exercise its option and purchase all of the Coast Dairies Property.

The proposal acted as a lightning rod for the burgeoning environmental community in Santa Cruz County, and protests were launched against it. Many now see the protest against PG&E proposal as the beginning of the modern conservation/preservation movement in the county (Scott and Wayburn, 1974). Eventually, seismic studies suggested that the site would not be appropriate for a nuclear power plant, PG&E shelved its plans and let their option on the Coast Dairies Property expire.

Wilder Ranch

Meanwhile, just south of the Coast Dairies property another proposal, this one for housing, was floated in 1969. The Wilder family sold the 2,000-acre ranch to the Moroto Investment Company and in 1972 the company announced its plan to build between 9,000 and 10,000 housing units on the property over the next 30 years. Fresh from their success with the PG&E nuclear power plant proposal, environmentalists formed Operation Wilder, and by 1973 the State of California allocated $6 million to purchase the land for a state park. Wilder Ranch State Park opened in the late 1980s (Jones, 1999).

Publication of the North Coast Bible, 1974

Following the example of other large-scale environmental movements, such as the move to save the redwoods or the Grand Canyon, a group of local authors and scientists collaborated in a book titled *In the Ocean Wind: The Santa Cruz North Coast* published by the Glenwood Press in 1974. Laden with photographs, poetry and essays, the book was a paean of praise for the North Coast. It is difficult to measure the impact that the book had on public sentiment, but it certainly was a reflection of the opinion held by a number of county residents at the time.

The Coastal Act

Put on the ballot as Proposition 20 and passed in 1972, the Coastal Zone Conservation Act put wheels in motion that eventually lead to the establishment of the California Coastal Commission in 1976. The Coastal Zone Act and the Commission rendered any further developments (such as those proposed for the Wilder property) difficult at best; probably impossible. The manager of the Coast Dairies property, Fred Pfyffer, and the corporation's attorney, Robert Bosso, were convinced that any development proposals for their Property would be extremely difficult, and they believed that the property would be increasingly difficult to sell. However, as the shareholders aged, their interest in selling the property increased (Bosso pers. comm., 2000).

Over the next 28 years the Property entered into a number of option agreements, none of which resulted in sale. The following list was provided in an interview with Robert Bosso in December, 2000:

Outright Sale to Lonestar Cement, 1986

The Coast Dairies shareholders placed a price of $12 million on the Property and offered it to Lonestar, but the company was not in an economic position to purchase the Property and the opportunity passed.

Zemex

In 1988 a Texas development company secured a three-year option on the Property which contained an automatic accelerating sale: $11 million if they exercised the option the first year and up to $15,000,000 if they did so at the conclusion of the three years. When the economy softened in Texas, Zemex's option expired around 1993.

The Bond Act of 1994

The purchase price of $17,500,000 was included in a state bond act offered to the voters of California in 1994. Meanwhile, the Nature Conservancy purchased an option on the Property (for $1) to hold it until the bond act passed. The act failed, however, and the option expired.

Bryan Sweeney and Nevada Pacific

In 1996, Nevada developer/businessman Bryan Sweeney (Nevada & Pacific Coast Land) took out an option on the Coast Dairies Property for a sale price of $20,000,000. His intent was to swap

the Coast Dairies for land under the control of the Bureau of Land Management in Nevada. Mr. Sweeney was not able to resolve the complicated details on the federal end of the transaction. His option to hold the Property was costing him approximately $1,000,000 a year.

Meanwhile, eager to sell the property outright, Sweeney promulgated the notion that there were 139 separate and distinct parcels within the 7,500 acres, and that he could and would sell those parcels to individuals for coastside homes (Sweeney, 1997). After a prodigious job of surveying each of the alleged parcels and preparing its history, Sweeney made the 139-parcel document, a blueprint for very high-end housing, public. Sweeney's document got everyone's attention, especially the Save-the-Redwoods League. Eventually, in a cooperative effort with the David and Lucile Packard Foundation, the Trust for Public Land, the Land Trust of Santa Cruz County, and the Nature Conservancy, the Coast Dairies Property was purchased from Nevada & Pacific Coast Land in October, 1998. The stage was set for its future as a unique natural and cultural asset, owned by those who will, hopefully, cherish both its present and its past.

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Census. US Bureau of the Census. Manuscript census, Santa Cruz County. 1870.

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SECTION 2.0

EXISTING CONDITIONS REPORT METHODOLOGY

2.1 INTRODUCTION

2.1.1 PROJECT OVERVIEW

The Coast Dairies Property includes multiple distinct watersheds with complex water rights; biological and cultural resources of statewide importance; prime (and pristine) beachfront; farming and mining that engage not only revenues but agricultural traditions and community economic stability; and a public with expectations both intense and conflicting. The complexity of the Coast Dairies Property demands a deliberate and fully disclosed treatment of how the Planning Team[1] obtained and used information supporting the proposed management recommendations.

The purpose of this section of the Existing Conditions Report (ECR) is to provide that disclosure in general terms. Details of discipline-specific methodology will be included in each technical section that follows; the purpose here is to describe the information systems used (e.g. "analysis zones," GIS) and some sense of the state of knowledge about Coast Dairies Property as the planning process was begun in 2000 - 2001.

The Existing Conditions Report is the first of three phases in the preparation of the *Coast Dairies Long-Term Resource Protection and Use Plan*. Following the publication of the ECR, its information will be used to perform an *Opportunities and Constraints Analysis* to determine, in a general way, what opportunities are available and which uses are compatible with what areas of the Property. The different combinations of uses and use restrictions become the "alternatives" in a process governed by the requirements of the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). Once a *preferred alternative* is selected from the range of alternatives, it becomes the Plan.

2.1.2 PROJECT LOCATION

The Coast Dairies Property (Property), as of August 31, 1998, was an estate with title vested in the Coast Dairies and Land Company, Inc. (CDLC), also shown of record as Coast Dairies & Land Co., Inc., a Corporation. The most recent title report was prepared by First American Title

[1] The Planning Team comprises the selected consultants, guided by Steering Committee and the Trust for Public Land.

Insurance Company, 330 Soquel Avenue, Santa Cruz, CA 95062 and issued on September 16, 1998.

The Property is situated in the State of California, County of Santa Cruz Unincorporated Area (approximately six miles north of the City of Santa Cruz), and on the coast between Laguna Creek at its southern boundary and Scotts Creek at its northern boundary. The Property extends inland approximately three miles and comprises nearly 7,000 acres. It is bisected by two public roads: State Highway 1 along the coast and Bonny Doon Road inland. The Property in 1998 was subject to 11 lease agreements varying from less than an acre (residential) to nearly 1,000 acres (RMC Pacific Materials) and several dozen easements and agreements. The Property is within the following Santa Cruz County Assessor's Parcel Numbers:

058-021-03	058-092-08	059-011-06
058-021-07	058-113-01	059-011-12 & 13
058-021-01	058-121-01	059-011-10
058-022-07	058-121-02	059-011-11
058-022-08	058-122-09	059-012-01
058-022-09	058-122-10	059-012-02
058-022-10	058-122-12	059-012-03
058-022-11	059-011-01	059-012-04
058-042-01	059-011-02	062-141-02
058-051-05	059-011-03	063-071-04
058-051-07	059-011-04	063-251-03
058-071-02	059-011-05	063-031-01

2.2 CONCEPTUAL METHODOLOGY

In the rapidly changing landscape of coastal California, exactly what are "existing conditions"? How do we measure them? The adequacy of scientific information is problematic for scientists and planners alike. Even if nature or society would sit still for us, any small fact - average local income or the number of deer on the Property or yearly sediment rate – reflects a land use history (e.g., timber harvest) and an interaction with other factors (e.g., global warming), any of which may be more important than the fact itself. It would seem obvious that many years of studies on various organisms or economic factors would yield better results, a more complete picture, but such is not always the case (Sprugel, 1991). And, in any event, the funding for exhaustive research is rarely available.

Instead, the general order that went out to the Coast Dairies consultants and team members early in the ECR process was to try to capture the natural and human environment not as a complete inventory, but in those subject areas or physical locations where:

- public ownership and management could conceivably result in a change in the status quo (e,g, agricultural operations);

- management would encounter a regulatory constraint (e.g., the status of species on the Property that are formally listed under the state and federal endangered species acts or the locations of valuable cultural resource sites);

- habitats are so diverse, productive, or sensitive that they deserve protection as a management priority (e.g., stands of native perennial grasslands); and

- the Planning Team identified significant issues, concerns and opportunities for restoration (e.g., watershed instability).

This last topic foreshadows the next step in the planning process, an analysis of *Opportunities* and *Constraints.* Generally, an *Opportunity* is a value judgement, a reflection of how important an analysis zone (see Section 2.5) is for the resource in question. This evaluates a current condition and not a hypothetical future state that could be obtained after management is applied. A *Constraint* is an assessment of compatibility with other uses within a given analysis zone. "Uses" as defined here are those reasonably foreseeable in managed, multiple use public land, such as recreation, grazing, and row crop agriculture. No assessment is absolute, but is made relative to other zones. The opportunities and constraints analysis is introduced as part of the Existing Conditions report phase, and is described in the subsections of these chapters entitled *Issues*.

2.3 ACQUIRING AND STORING INFORMATION

All the files compiled by the Trust for Public Land (TPL) during its period of tenure were reviewed and sorted, with technical information extracted and passed on to team members. All items in the files (including correspondence) were then entered into a database made available to all Planning Team members.

The database uses Microsoft Access to create bibliographic records. It contains information about reports, plans, contracts, applications, memoranda, letters, maps, charts, forms, telephone messages, and other documents either generated by TPL or the Planning Team in connection with the project. Bibliographic data on each document includes, to the extent available, titles, authors, sources, publication dates, the intended audience, inclusion of graphics and tables, references to associated documents within the project library, a brief explanation of the documents' contents, pagination, and other descriptive information.

The database was designed to provide:

- a system for cataloging documents in the project library;

- the ability to generate bibliographies;

- a means of searching the library's contents. Searches include, but are not limited to, titles, topical areas, dates, documents generated by or addressed to a particular person, agency, etc., associated with the project, or memoranda and letters associated with a particular date; and

- a catalogue of the project's administrative record.

As additional sources were identified (e.g., during meetings with the Community Advisory Group) these made their way into the database as well and, together with the files and bibliographic sources discussed below, formed the initial collection of the *Project Archives*. Establishing and maintaining Archives allows the project to store information (photographs, for example) which are too voluminous to include in the ECR or the Plan itself. The Archives will be turned over to the land managers when the Property transfer is complete. Much of this information will be in the form of compact disk (CD) and GIS (see Section 2.6) files.

2.4 REVIEW OF EXISTING INFORMATION

Beyond the sources obtained directly from TPL, the Planning Team prepared a bibliography for the Property, using such electronic search tools as:

- Wildlife Worldwide (searches technical journals, including California Fish and Game, Wildlife Review, Wildlife Information Service, Fish and Wildlife Reference Service, and Waterfowl and Wetlands Bibliography);

- Melvyl (searches UC Library catalogues; provides access to Current Contents);

- Biosis (searches Biological Abstracts);

- Dissertation Abstracts;

- Fish and Wildlife Reference Service (searches Government Printing Office documents).

Beginning in July 2000, and continuing throughout the project, members of the Community Advisory Group (CAG) were asked to provide anecdotal information (or source material the Planning Team had missed) using an *Information Source Record Form*. These submissions were in addition to the extensive personal interviews conducted for the land use history (Section 1).

2.4.1 PREVIOUS REPORTS PREPARED FOR CDLC OR ON ITS PROPERTY

General

Cultural and historical documents were cited in the previous section. The earliest comprehensive resource surveys for the Property were conducted and compiled by Pacific Gas & Electric, when in 1971 the utility considered building a nuclear power plant at El Jarro Point near Scotts Creek

Beach. PG&E published reports on geology, hydrology, water quality, biology (e.g., Craig and Drysdale, 1971), timber resources and agriculture. More recently, PG&E conducted surveys under its powerlines on the Property (Taylor, 1999).

RMC Pacific Materials, Inc. (RMC), which operates the cement plant, a limestone quarry, and a shale quarry on lands it owns or leases from CDLC, has commissioned multiple studies and surveys over the past two decades (see for example Engineering Science, 1991 and Madrone Landscape Group, 1992). Those involving streams flowing through the Property are cited below and in the appropriate sections of the ECR. As an outcome of an environmental review conducted by Santa Cruz County for RMC's operations in the mid-1990s, settlement ponds and culverts and potential effects on the California red-legged frog (*Rana aurora draytonii*) became the subject of a Habitat Conservation Plan (HCP). Several reports were submitted by Biosearch Wildlife Surveys in support of the HCP (Biosearch, 1996a-d), and the U.S. Fish and Wildlife Service prepared a Biological Opinion (USFWS, 1996).

In the early 1990's, the California Coastal Conservancy and Santa Cruz County began recording the success of nest protection for the snowy plover (George, 1993) on Property beaches, an effort that continues to the present. In 1994, the Conservancy commissioned a broader habitat assessment report (Josselyn et al., 1994), in support of its interest in purchasing the property. Josselyn mapped habitats and reported occurrences of special status species. Later that year (November), the Habitat Restoration Group (HRG, 1994) conducted biological surveys and a wetland delineation for a proposed (but never constructed) pipeline and reservoir on the Property. In response to a request from the County of Santa Cruz, HRG returned to the area in 1996 (HRG, 1996) for focused surveys for the San Francisco popcorn flower (*Plagiobothrys diffusus*) and the California red-legged frog (*Rana aurora draytonii*).

In the spring of 1999, volunteers participated in the first season of the Central Coast Riparian Bird Conservation Project. This project was initiated by the Point Reyes Bird Observatory (PRBO) and the Coastal Watershed Council (CWC) with the help and cooperation of a large network of agencies and individuals. Surveys included Liddell and San Vicente Creeks, and will continue indefinitely. PRBO also maintains the nesting exclosures for, and keeps data on, the snowy plover on Coast Dairies beaches.

Fisheries

In 1982, Harvey & Stanley Associates and John Gilchrist & Associates prepared *Fish Habitat Assessments for Santa Cruz County Streams* for the Santa Cruz County Planning Department. This study assessed habitat conditions and fishery populations in 15 Santa Cruz County streams including San Vicente, Liddell and Laguna Creeks. Two years later Creegan and D'Angelo (1984), who were principal investigators in the earlier work, provided similar information for Lone Star Industries (the precursor to RMC) in the report *Watershed Analysis: San Vicente Creek, Mill Creek, Liddell Creek, East Branch Liddell Creek.* The text discusses habitat conditions for migrating, spawning, rearing, and overwintering anadromous salmonids. The

effects of water diversions are also addressed. The report also offers recommendations for the improvement of habitat conditions in these streams.

Marston (1992) compiled a stream survey report of lower Scotts Creek[2]. His report summarizes the results of aquatic habitat and fish population assessments conducted in the lower 0.5 mile reach of Scotts Creek. Investigators observed several thousand fish, comprised primarily of steelhead trout and coho salmon, and also including tidewater gobies. The aquatic habitat was found to be very productive when water was present.

Marston's work laid the foundation for Snider et al. (1995) to calculate.minimum flow requirements for the California Department of Fish and Game (CDFG) in their paper *The relationship between instream flow and coho salmon and steelhead habitat availability in Scotts Creek, Santa Cruz County, California*. This CDFG report discusses the life histories and habitat requirements of coho salmon (*Oncorhynchus kisutch*) and steelhead (*O. mykiss*) in detail before describing the approach, methodology, and results of the Department's minimum flow requirement study. The study recommends that no water withdrawals occur on Scotts Creek when instream flows are below 40 cubic feet per second (cfs) in January through March, 25 cfs in May, 10 cfs in May, 6 cfs in June through October, 8 cfs in November, and 12 cfs in December.

In addition to the two studies of Scotts Creek prepared by other investigators, McGinnis (1991) evaluated the anadromous fish spawning and parr rearing habitats of the Liddell and San Vicente Creeks for RMC. This report summarizes the results of habitat and population surveys for steelhead trout (*Oncorhynchus mykiss*), California red-legged frogs (*Rana aurora draytoni*), and foothill yellow-legged frogs in two major Coast Dairies watersheds. The study also included an analysis of the limestone content of stream sediment samples to ascertain whether RMC sedimentation ponds were functioning effectively. The report concludes that San Vicente Creek, while suffering from modest sedimentation and a lack of extensive deep pools, remains one of the most productive anadromous fishery creeks in the greater Santa Cruz/San Mateo County area. Liddell Creek also supports a small steelhead population. Red-legged frogs were observed in two locations.

University of California

Lastly, the Property has been the locus of several research projects conducted by students and faculty from the University of California. Perhaps the most recent of these was Scholar's (1998) Master's Thesis on sediment transport at Yellow Bank Beach. Research on the effects of grazing on coastal prairie at Coast Dairies is ongoing (Holl, 2000)

[2] Although Scotts Creek is not on the Property, CDLC owns a portion of Scotts Creek Beach and its tenants use creek water.

2.4.2 OTHER RELEVANT LAND USE DOCUMENTS AND PLANNING GUIDANCE

The beaches on the Property have long been considered a Santa Cruz County asset. Their condition and use for recreation were detailed in the County's *North Coast Beaches Master Plan* and in Nicholas Berman Environmental Planning (1989). The 1991 beach plan was itself a summary of other reports and public testimony between 1983 and 1989. Plan policies included preservation/restoration measures (e.g., exotic plant removal) and interpretive signing, but limited recreation amenities.

The two prospective land management agencies for Coast Dairies, the Bureau of Land Management (BLM) and the California Department of Parks and Recreation (DPR) have recently produced two planning manuals for areas under their jurisdiction. BLM's recent edition of the planning handbook (BLM, 1999) reconciles a variety of federal land use regulations and policy direction. This level of planning, the handbook states, identifies uses, or allocations, that are allowable or prohibited on subject lands and establishes certain administrative designations, such as Areas of Critical Environmental Concern. The handbook also appends the text of a recent Memorandum of Understanding between BLM and the U.S. Fish and Wildlife Service to facilitate compliance with the Endangered Species Act. The California State Parks, General Plan Improvement Team, (DPR, 1998) prepared a document describing the state's planning structure and content and format guidelines for state park plans. Of particular interest is the direction to produce a "statement of management intent" tailored to the needs and resources of specific park areas and the requirement that the plan integrate all information necessary to satisfy the California Environmental Quality Act.

2.5 ANALYSIS ZONES

2.5.1 PURPOSE

The challenge of information gathering and archiving leads to one of organizing and analyzing. It should not be surprising that the Plan does not treat all acres, and perhaps no single watershed alike. In the interests of protecting resources and, possibly, segregating different types of use, wildlands need to be zoned in much the same way cities and towns are. In the Plan, there will be *Management Zones*, areas for which management directions or "prescriptions" have been developed to determine what can and cannot occur in terms of resource management, visitor use, access, facilities or development, and park operations.

Since these decisions (with the exception of Stream Protection Zones) are not implied in the ECR[3], the information requires an interim zoning tool—the Analysis Zone--that breaks the property up into polygons (mapped areas) based on the *existing nature and condition of the resources*. A uniform system of designation is also advisable because it standardizes the way

[3] Management Zones are not described or delineated in this document.

different planning Team Members reference geography. For instance, an economist might call an easement by the holder's name; a recreation analyst might talk about a meadow by referring to the nearest road or trail. A zone label -- even one which is a collection of numbers and letters – eliminates any confusion.

At some point in the planning process, ECR information, Opportunity and Constraints determinations, public input and regulatory concerns are resolved within, and sometimes across the boundaries of, the analysis zones. This is the operational part of the Plan. The Plan will be organized by watershed, and then, finally, by management zones as described above. It is expected that the analysis zones will in some part retain their geographic identities when they become management zones, but will change from a way of organizing information to a way to implement management prescriptions for how the land will be used.

2.5.2 DESIGN

The Coast Dairies Property covers all or portions of six distinct watersheds. All are coastal watersheds with headwaters within the steep western slope of the Santa Cruz Mountains, and all are defined by coastal streams that descend through steep ravines to coastal bluffs and eventually discharge to the ocean. Each watershed differs in specific characteristics, however. Moreover, watersheds are natural "hard" boundaries for organizing natural resource issues, and are thus the first identifier for an analysis zone. The five major creeks on the Property - **Molino, San Vicente, Liddell, Yellow Bank** and **Laguna** Creeks - are the first letters of the analysis zone designation (**M, SV, L, YB, and LA**, respectively).

Within each of the watersheds on the Property, there are areas that comprise a roughly similar mixes of natural resources, as indicated primarily by their vegetation. Examples of these zones include: riparian areas, agricultural areas, and wetlands. The vegetation "signature" of a polygon was the first diagnostic for an analysis zone. Other resource bases apart from vegetation could have been used, of course, (for example, soil types) but the Planning Team considered extant vegetation as the best diagnostic for a variety of attributes, including the important one of recent land use history.

Although they begin with vegetation, the polygons of the zones are necessarily somewhat arbitrary and for practical purposes cannot be highly refined expressions of the ecologists' art. For example, when Josselyn et al. (1994) categorized habitats, he defined over 200 polygons, far too unwieldy a number for this ECR. If the possible ultimate use of an analysis zone as a management zone is considered, 200 sites averaging 35 acres each is not an efficient way to proceed. Rather, the planning team overlaid the Josselyn map on an orthophoto (an aerial photo which has been corrected to the same cartographic standards as a topographic map) and combined the Josselyn types in higher-order aggregations within watershed boundaries. "Lumping" habitat types in this manner -- grouping similar types and allowing predominant expanses to incorporate small islands of other types -- expresses the important assumption that the analysis zones will be

similar in their response to both natural forces and human activities[4]. Thus the zones, while derived from vegetation mapping, are not intended as a substitute for it. For botanical classifications and detail, see Section 3.1

Each zone was then labeled (coded). The nomenclature of the codes is loosely based on habitat terms but substitutes a current condition term (e.g., right of way) where that is clearer. The Stream Protection Zones are the only designation which suggests the ultimate management direction. The zones labels are as follows:

Beach (B) - Coastal sandy beach and dunes.

Prairie (P) – Grasslands on benches, moderate (<20 percent) slopes. This is generally the "non-native grassland" as described by Josselyn or the "Coastal Prairie" as described by the Santa Cruz Chapter, California Native Plant Society (CNPS). Zones may contain stands of perennial bunchgrasses, but are mainly annual grasses and perennial forb species.

Coastal Terrace (CT) and Coastal Terrace Bluff (CTB). These two zone types contain all lands currently used for crop production. The Coastal Terraces are those areas which have been modified for agriculture (levelled). They may originally have been more like the "Prairie" type but are underlain by coastal terrace deposits younger Miocene-aged Santa Cruz Mudstone that occurs higher up. Where these terraces are at seaside, they end in steep coastal bluffs -- sandstone bedrock outcrops with their own unique features.

Woodland (W). These polygons comprise all the areas designated by Josselyn as Mixed Forest, Oak Woodland and Redwood Forest. The assumption is that these large areas, while not having exactly the same resources, will have the same types of sensitivities to visitor use.

Shrub (S). These area are steep (usually >30 percent slopes) and are roughly the same as the Santa Cruz CNPS "Coastal Scrub." Plants are generally under six feet tall and include buckwheat, sagebrush, yarrow, lupine, and coyote bush.

Marsh (M). As defined by CNPS in Santa Cruz, these are seasonally or permanently flooded areas along streams, lakes, ponds, and springs. There is only a single analysis zone with this designation, at the lower end of Laguna Creek. It is characterized as a freshwater marsh, but is brackish at the mouth.

Developed/Disturbed (D) and Right-of-Way (ROW). Areas with little or no natural vegetation, dedicated primarily to human use.

[4] The use of this concept caused some concern among early ECR reviewers. It should be regarded as a simplified planning tool and not an instrument which is intended to carry complete, or even fully accurate information. It does not replace more elaborate models of wildlife habitat, vegetation, or watershed to be developed later in the ECR.

Stream Protection Zone – The SPZ designation is one exception to the rule that no prescriptions are implied for any analysis zone. Although this corresponds to "Riparian Woodland" (stream banks with a constant water supply) as the term is used by Santa Cruz CNPS, the priority role in water supply and endangered species habitat maintenance suggested it be declared protected in principal throughout the planning process, with a uniform 100-foot buffer on both sides of the stream.

On the Analysis Zone Map (Figure 2-1) the codes for the polygons are derived by adding the watershed designation to the second term, thus a coastal terrace in the Molino watershed would be labeled Molino Coastal Terrace or MCT. If there is more than one of the polygon type in the watershed (e.g., if a region of terrace is divided by a Shrub analysis zone) it is assigned a number, MCT-1; MCT-2, etc.

2.6 USE OF GIS

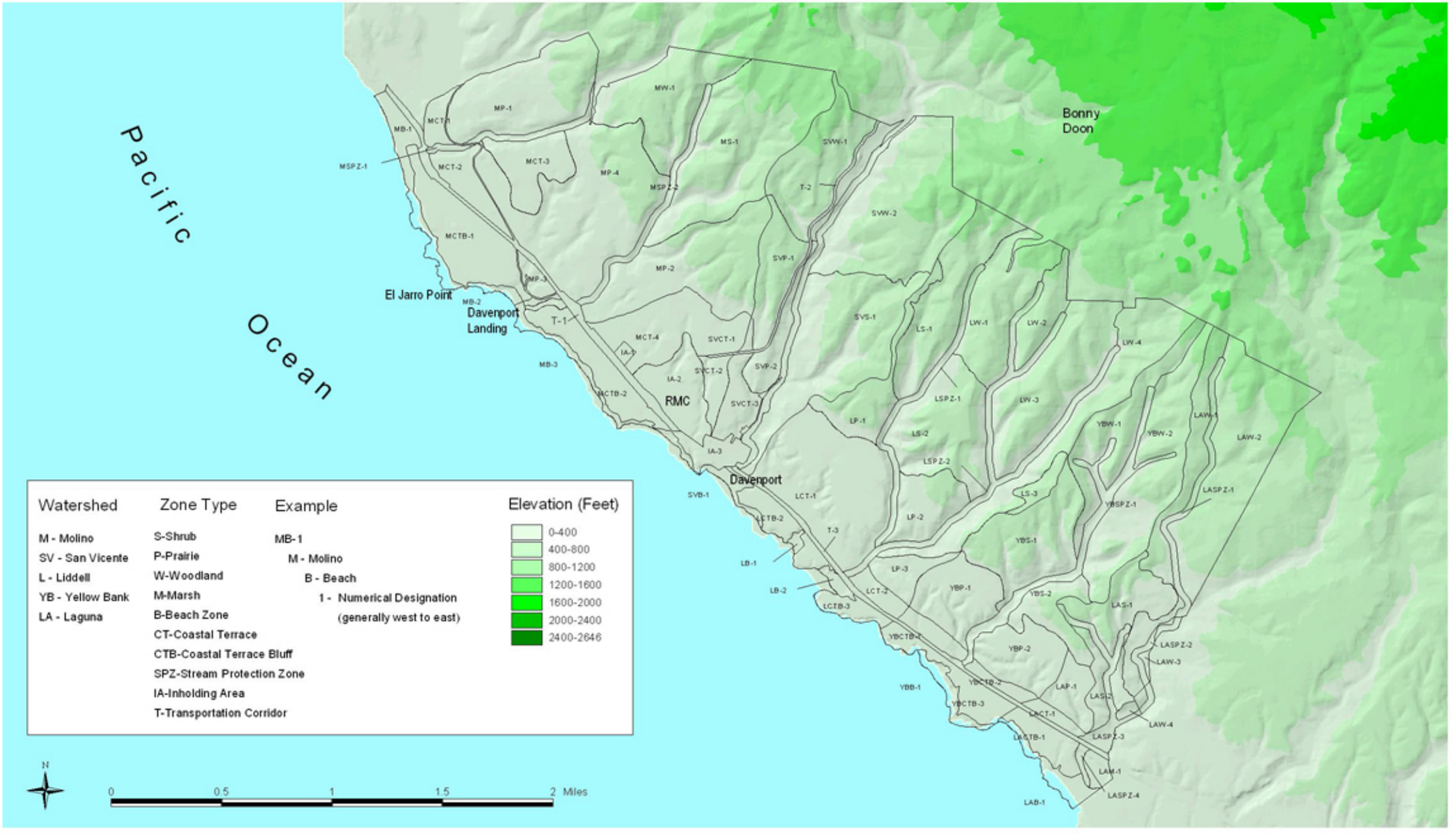
A key element of the Long-Term Resource Protection and Use Plan for the Coast Dairies Property will be documenting and understanding the spatial distribution and relationships among a wide variety of natural and man-made features. A major role in providing this understanding will be played by the Geographic Information System (GIS). GIS allows for accurate mapping and printing of maps by absorbing information in digital format. This information will be critical not only in this ECR phase, but in the preparation of the Opportunities and Constraints Analysis as well. In the longer run, it will be a tool for resource managers, linking all resource maps with much of the text information in the Plan and Project Archives

The GIS will be used to:

- assemble and standardize existing and newly collected digital map layers;
- provide easy access to these map layers for review and use in preparing maps;
- provide a tool for performing the Opportunities and Constraints Analysis and for evaluating land management alternatives; and
- provide a tool and associated database that can be refined and updated in the future by land management agencies for ongoing land management activities.

2.6.1 SYSTEM CONFIGURATION

The Planning Team uses ArcView GIS software (Environmental Systems Research Institute) for all GIS data and analysis applications. The software will include both ArcView and the ArcView Spatial Analyst extension. All GIS data will be delivered in ArcView shape file format. Applications will be built from ArcView/Avenue scripts and delivered as either ArcView projects



SOURCE: Environmental Science Associates, Pacific Meridian Resources, USGS

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Figure 2-1

Analysis Zones on the Coast Dairies Property

or extensions. GIS data processing during the course of the project will be performed using both ArcView and ARC/INFO GIS software.

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SECTION 3.0

NATURAL RESOURCES OF THE COAST DAIRIES PROPERTY

3.1 BOTANICAL AND WETLAND RESOURCES

3.1.1 REGIONAL SETTING

The Santa Cruz coastal region has a Mediterranean climate and is a mosaic of upland oak, mixed evergreen, and redwood forests, native and exotic grasslands, upland scrubs, wetland communities, and riparian scrubs and forests. In the "bioregional" characterizations developed as part of California's Agreement on Biological Diversity (a multi-agency memorandum signed in 1993), the area is near the regional separation between the Bay Area-Delta and South-Central Coast Bioregions. This position makes Santa Cruz County within the range of several species common to either bioregion. In addition, proximity of the coastal mountains has partially isolated the area, and resulted in a high level of endemism (i.e., species restricted to this area alone).

Past and on-going human activities (e.g., logging, agricultural development, residential development, mining) in the region have reduced open space, limiting large expanses of most natural communities and altering natural vegetative patterns. These phenomena are evident at Coast Dairies and described further below.

3.1.2 METHODOLOGY

The emphasis of this section is to provide a description of existing vegetative and wetland resources on the Property. Data presented herein are based on existing reports and information, consultation with resource agencies and knowledgeable individuals and site reconnaissance. Floristic surveys of the property were conducted by Planning Team botanists and plant ecologists in June, August and October, 2000 and in February, March and April, 2001. On two occasions, the team was assisted by botanists from the Santa Cruz Chapter of the California Native Plant Society(CNPS), and their assistance is gratefully acknowledged.

The intent of these surveys was to identify species presence and composition on the Property. Although every analysis zone was visited, particular emphasis was placed on surveying areas with the highest potential to support rare species of plants or rare plant communities (e.g., areas of native grassland). Data were recorded in field notebooks and on Property maps.

3.1.3 VEGETATION

The Property currently supports 17 distinct native vegetative communities and three communities dominated by introduced non-native species.[1] These communities include: beach and foredune; two grassland communities (California annual grassland and purple needlegrass grassland); three scrub communities (central dune scrub, California sagebrush coyote brush scrub); five upland woodlands and forests (coast live oak woodland [occurring as both an upland and riparian community on-site], mixed evergreen forest, mixed conifer forest, redwood forest, and eucalyptus/Monterey cypress woodland); three riparian communities (coast live oak riparian, central coast arroyo willow riparian scrub, and red alder riparian forest); and various types of freshwater wetlands and seeps. These plant communities vary in terms of diversity.[2] Generally, high-diversity[3] vegetative communities are regarded as more ecologically stable and less common, and are therefore usually accorded a higher level of resource protection. For example, high-diversity vegetative communities typically support many plant species or equal abundance of plants that fill all or most available plant niches, and are less susceptible to exotic invasive species.

The California Department of Fish and Game (CDFG) has identified specific native plant communities within California as rare and/or sensitive. These natural communities are of special significance because the present rate of loss indicates that additional acreage reductions or further habitat degradation may threaten the viability of dependent plant and wildlife species and possibly hinder the long-term sustainability of the community or species dependent upon the community. As natural communities diminish, the need to list component plant and wildlife species as rare, threatened, or endangered under state or federal Endangered Species Acts increases. Loss of some significant natural communities can diminish valued ecosystem functions, such as the roles of marshes in water filtration, or of riparian woodlands in river bank stabilization. Some of these natural communities have a rich complement of sensitive species and species-oriented programs that will usually protect them. Other communities do not support rare species and, therefore, species-oriented protection cannot be invoked in these cases (CNPS, 1994).

Several significant vegetative communities, including northern maritime chaparral, northern coastal salt marsh, and Monterey pine forest are documented as occurring within the vicinity of

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1 Natural communities are recurrent combinations of species that reflect parallel responses to similar combinations of environmental conditions and are not dependent on human intervention. For this discussion, native vegetation pertains to those species present in California prior to colonization by Europeans, while species such as wild oats and brome grasses, which dominate much of the current California landscape, are considered exotic or naturalized. Vegetative communities which are dependent on human intervention (i.e., sowing seeds, planting saplings, irrigation) such as irrigated agriculture or landscaping are considered introduced (non-natural) communities.

2 The term 'diversity' is defined as the total number of plant species and their relative abundance present within a community type.

3 For the purposes of this document, 'high-diversity' refers to many species or equal abundance of plants occurring within a specific vegetative community that is beyond that normally encountered for a particular community. 'Medium-diversity' refers to vegetative communities that are roughly equal to that normally encountered for that community and 'low-diversity' refers to vegetative communities that support fewer total species or unequal abundance than normal for a particular community.

the Property (CDFG, 2000). None of these documented vegetative communities have been observed on the Property. However, a number of other sensitive vegetative communities are present, including northern foredune, purple needlegrasss, and red alder riparian forest. Sensitive plant communities are listed in Table 3.1-1.

The following community descriptions include limits of distribution, habitat requirements, community sensitivities, and a list of characteristic plant species. Descriptions are based on observations of dominant[4] plant species and their common associates. Descriptions of vegetative communities in this report primarily follow classification guidelines set forth by the CDFG (Holland, 1986), the CNPS (Sawyer and Keeler-Wolf, 1995), and a local Santa Cruz CNPS task force (McPherson et al., 1995). These classification systems were modified to accurately describe site-specific conditions on the Property. Refer to Figure 3.1-1 for a map of vegetative communities on the Property. A full list of plant species observed on-site is included in the Project Archives.

3.1.3.1 BEACH AND FOREDUNE COMMUNITIES

Beach

The Beach community forms along the Pacific Ocean, where high wind speeds have deposited sand granules. This community is mostly bare due to environmental conditions, including salt spray deposition, high wind speeds, and full sun exposure. These environmental conditions gradually decrease moving away from the beach. The inland side of the beach can support a sparse distribution of low-growing plants, such as sun cup (*Camissonia cheiranthifolia*) and sand-verbena (*Abronia umbellata*, *A. latifolia*), that are able to tolerate a substantially harsh environment. These plants colonize sand blowouts and become stabilized in the soil as the wind-blown sand accumulates around the base of the plant. Major beach formations on the Property include Scotts Creek Beach, Davenport Landing Beach, Davenport Beach and Bluffs, Panther Beach, Bonny Doon Beach, Yellow Bank Beach, and Laguna Beach.

Northern Foredune. Northern foredune community is located in areas of sand accumulation along the coast as far south as Point Conception in Monterey (Holland, 1986). Northern foredune vegetation is adjacent to bare beach areas, where the environmental conditions are lessened relative to the beach. The plants in this community are sparsely distributed on sandy soils. In addition to the environmental conditions to which the beach is subject, plants in this community are exposed to periodic reburial of plant roots and sand blowouts due to high winds. As a result, foredune species are low-growing perennial forbs, grasses and subshrubs that respond to varying levels of environmental disturbance. Sand-verbena, sea rocket (*Cakile maritima*) and sun cup dominante this community. Associated species include dune sagebrush (*Artemisia pycnocephala*) and mock heather (*Ericameria ericoides*). Foredune vegetation intermixes with

[4] The term 'dominant' is defined as the overstory species that contributes the most cover or basal area to the community, compared to other overstory species. This definition is based on physiognomy (architecture of canopy layers and life form).

TABLE 3.1-1
SENSITIVE PLANT COMMUNITIES OCCURING ON OR WITHIN THE VICINITY OF THE COAST DAIRIES PROPERTY

Common Name	Listing Status (TNC/CDFG)	General Description	Site Occurrence
California sagebrush	G3, S3.3	Dominated by *Artemisia californica* and *Rhamnus californicus,* associates include *Mimulus aurantiacus, Castilleja ssp., and Eriogonum ssp.*	Primarily occurs on-site on south facing slopes with shallow soils of the upper coastal terraces.
Central coast arroyo willow riparian forest	G3, S3.2	Dominated by *Salix lasiolepis*. Associates include *Sambucus mexicana* and *Rubus spectabilis*.	Found primarily along the lower reaches of streams, including Ferrari and Yellow Bank Creeks (Analysis Zone YBSPZ-1).
Central coast live oak riparian forest	G2, S3.2	Dominated by *Quercus agrifolia*. Common associates include *Rosa californica*, *Artemisia douglasiana*, and *Rubus ursinus*.	Various.
Central dune scrub	G2, S2.2	Dominated by low growing shrubs, subshrubs, and herbs, such as *Artemisia pycnocpehala* and *Ericameria ericoides*	Beaches/coastal.
Coast live oak woodland	G4, S4	Dominated by *Quercus agrifolia* with *Umbellularia californica* as a common overstory associate. Understory associates include *Symphoricarpos mollis, Toxicodendron diversilobum,* and *Galium aparine*.	Occurs primarily in the upper canyons and on the upper terraces of the Property, in Zone LAW-2 for example.
Freshwater seep	G3, S3.2	Occurs in permanently moist or wet soils. Dominated by perennial herbs, including *Juncus* spp., *Carex* spp., and *Mimulus guttatus*.	The largest examples of this vegetation type occur in the Molino Creek (Zone MS-1)watershed and the Yellow Bank Creek watershed (Zone YBW-2).
Knobcone pine forest	G4, S4	Knobcone pine is the sole or dominant tree in the overstory canopy. Occurs on ridges, upper slopes in dry, rocky, infertile soils.	Located on-site in the upper reaches of the Liddell Creek watershed—Analysis Zones LW-3 and LW-4.
Maritime coast range ponderosa pine forest	G1, S1.1	Dominated by *Pinus ponderosa*	Both sides of Martin Road near Bonny Doon (not on Property).
Monterey pine forest	G1, S1.1	Dominated by native stands of *Pinus radiata* intermixed with *Pinus attenuata*	South of Waddell Creek—native stands not identified on the Property.
Northern coastal salt marsh	G3, S3.2	Dominated by *Salicornia virginica*	Mouth of Scotts Creek.

TABLE 3.1-1 (Continued)
SENSITIVE PLANT COMMUNITIES OCCURING ON OR WITHIN THE VICINITY OF THE COAST DAIRIES PROPERTY

Common Name	Listing Status (TNC/CDFG)	General Description	Site Occurrence
Northern foredunes	G2,S2.1	Dominated by perennial grasses and low growing, often succulant perennial herbs and subshrubs. Characteristic species include *Abronia latifolia, Cakile edulenta*, and *Elymus mollis*	Located on-site at a number of beaches, including those at Davenport Landing and Bonny Doon Beach.
Northern interior cypress forest	G2, S2.2	Dominated by *Cupressus abramsiana* intermixed with pines.	"Type locality" at Bonny Doon.
Northern maritime chaparral	G1, S1.2	Dominated by *Arctostaphylos silvicola, Arctostaphylos tomentosa, Pinus attenuata, Ericameria ericoides, and Baccharis pilularis*	Both sides of Martin Road near Bonny Doon(not on Property)..
Purple needlegrass	G3, S3.1	Contains *Nasella pulchra, Elymus glaucus*, non-native annual grasses, and a mix of herbaceous perennials, including *Sidalcea malvaeflora, Cholorgalum pomeridianum*, and *Muilla maritima*	Found on the uppermost terraces of the Property that have generally not been farmed. An example occurs in Analysis Zone YBS-1.
Red alder riparian forest	G2, S2.2	Dominated by *Alnus rubra*, stands near streams tend to be monocultural, those further removed from stream disturbance can include *Cornus* ssp. and a variety of shrubs, such as *Ribes* ssp. and *Physocarpus capitatus* as associates	Occurs along medium sized to large streams. An example occurs in Analysis Zone SVSPZ-1.
Redwood forest	G2, S2.3	Dominated by *Sequoia sempervirens*, with *Lithocarpus densiflorus* and *Polystichum munitum* as common associates	Occurs primarily on north-facing slopes within Zones LW-4, SVW-2, and LAW-2.

STATUS CODES:

The Nature Conservancy (TNC) – Global Heritage Program rarity ranks:

G1: Fewer than 6 viable occurrences worldwide and/or 2000 acres
G2: 6-20 viable occurences worldwide and/or 2000-10,000 acres
G3: 21-100 viable occurrences worldwide and/or 10,000-50,000 acres
G4: Greater than 100 viable occurrences worldwide and/or greater than 50,000 acres

State Rarity and Threat Ranks:

S1: Fewer than 6 viable occurrences statewide and/or 2000 acres
S2: 6-20 viable occurences statewide and/or 2000-10,000 acres
S3: 21-100 viable occurrences statewide and/or 10,000-50,000 acres
S4: Greater than 100 occurrences statewide and/or greater than 50,000 acres

0.1: Very threatened
0.2: Threatened
0.3: Unknown

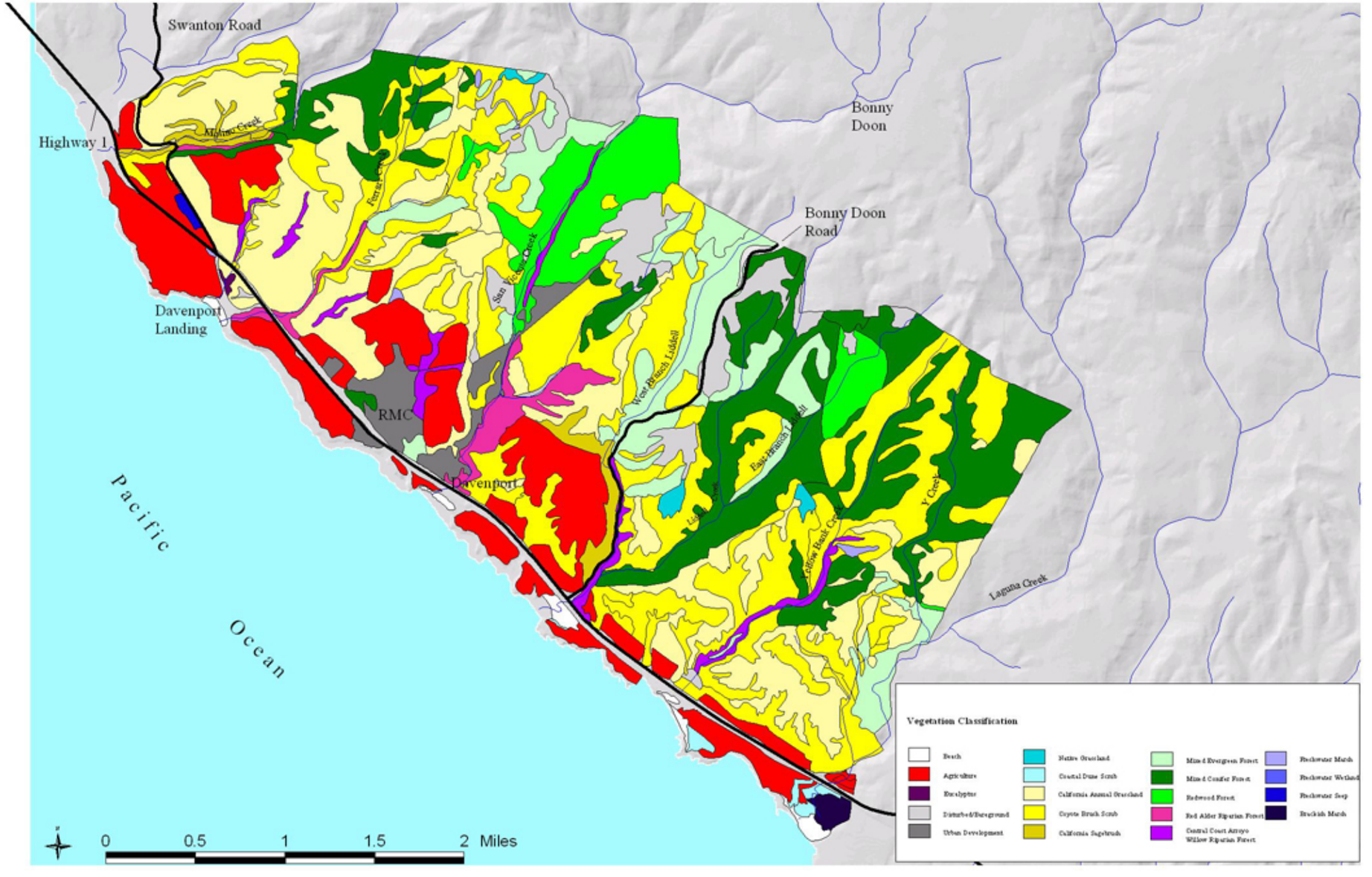
coastal dune scrub on inland sites. CDFG defines this community as very threatened, with only 1,000-3,000 individuals or 2,000-10,000 acres remaining (S2.1).

3.1.3.2 GRASSLAND COMMUNITIES

Grasslands on the Property occupy the tops of terraces and are described herein as two separate community types based on the dominant species present: California annual grassland and the native perennial purple needlegrass grassland. Distribution of these grassland communities is primarily dependent on soil composition and depth, as well as past and ongoing disturbance regimes, such as grazing. The presence of non-native annual grasses, which originate from the Mediterranean region, is a consequence of permanent alterations to once widely-distributed, pristine perennial grasslands in California. The conversion of native perennial grassland into non-native annual stands has resulted from a combination of invasion by exotic plant species, changes in the kinds of animals and their grazing patterns, cultivation, and suppression of fire (Heady, 1988).

California Annual Grassland. Non-native annual grasslands are distributed throughout the valleys and foothills of most of California, except for the north coastal and desert regions, usually below 3,000 feet (4,000 feet in southern California) and range from Oregon to northern Baja California (Holland, 1986). California annual grassland on the Property comprises a dense to sparse cover of non-native grasses often associated with numerous annual and perennial herbaceous forbs. These grasslands typically occur on fine-textured, clay-rich soils, which are moist to waterlogged during winter rains, and dry during the summer and fall (Holland, 1986). Species in this community usually germinate in the late winter, grow actively during the winter and early spring, then produce numerous seeds that remain dormant during the summer and early fall. Annual species favor disturbance events such as grazing. Species in this community include numerous common non-native grasses, including vulpia (*Vulpia myuros*), wild oat (*Avena barbata*) and bromes (*Bromus hordaceus, B. diandrus,* and *B. madritensis*). Associated forbs include a mixture of native and non-native species, including black mustard (*Brassica nigra*), thistles (*Centaurea calcitrapa, Carduus pycnocephalus*), California poppy (*Eschscholzia californica*), California buttercup (*Ranunculus californica*), clovers (*Orthocarpus* and *Trifolium* spp.), filaree (*Erodium botrys, E. cicutarium*) and bluedick (*Dichelostemma capitatum* ssp. *capitatum*).

Purple Needlegrass. Historically, native bunchgrasses, such as purple needlegrass, were much more widespread throughout California. The introduction of exotic grasses and forbs, overgrazing, and alteration of the community's natural fire regime are factors implicated in the displacement of native bunchgrasses and forbs by introduced species. On the Property, purple needlegrass grassland remains dominated by herbaceous perennial species. Native grasses include California oatgrass (*Danthonia californica*), blue wildrye (*Elymus glaucus*), purple needlegrass (*Nassella pulchra*), and California brome (*Bromus carinatus*). Associated herbaceous species include California poppy (*Eschscholzia californica*), checkerbloom (*Sidalcea malvaeflora*), soap root (*Chlorogalum pomeridianum*), Ithuriel's spear (*Triteleia laxa*)and common muilla (*Muilla maritima*). An integral part of this community is the high diversity of



SOURCE: Environmental Science Associates, USGS, Pacific Meridian Resources

Coast Dairies / 200071

Figure 3.1-1

Vegetation Classification on the Coast Dairies Property

wildflowers intermixing with grass species, which produce colorful blooms throughout the spring and early summer months. CDFG defines this community as very threatened, of which only 3,000-10,000 individuals or 10,000-50,000 acres remain (S3.1).

Scrub Communities

Three scrub communities, including central dune scrub, California sagebrush, and coyote brush scrub, are distributed throughout the Property.

Central Dune Scrub. Central dune scrub is restricted to the coast between Bodega Bay and Point Conception (Holland, 1986). Coastal dune scrub lies adjacent to and directly inland from dune vegetation. This community consists primarily of subshrubs (low-growing woody species). The distribution of plants is fairly dense, since this community is subject to wind and full sun exposure. Salt-spray deposition and sand blowouts are thus reduced by dense vegetation. Dominant species observed include dune sagebrush, mock heather, coyote brush (*Baccharis pilularis*), yellow lupine (*Lupinus arboreus*) and seaside woolly sunflower (*Eriophyllum staechadifolium*). Associated species include bush monkeyflower (*Mimulus aurantiacus*), California coffee berry (*Rhamnus californica*), and western poison oak (*Toxicodendron diversilobum*). CDFG defines this community as threatened, with 1,000-3,000 individuals or 2,000-10,000 acres remaining (S2.2).

California Sagebrush. This vegetation type occurs on south-facing slopes where temperatures are higher and soil conditions are dry, primarily in the northern portion of the Property. California sagebrush (*Artemisia californica*) is the dominant species and associated species include bush monkeyflower, deer weed (*Lotus scoparius*) and coyote brush. In some areas paintbrush (*Castilleja* spp.) and buckwheat (*Eriogonum latifolium*) are found.

Coyote Brush Scrub. Coyote brush scrub is distributed from southern Oregon to San Mateo County and from Pacific Grove to Point Sur (Holland, 1986). This scrub community occurs throughout the Property primarily on bluffs and hillside slopes of canyons, gullies and valleys. Coyote brush scrub consists of a dense to moderately open shrub canopy with a sparse herbaceous understory. Most growth and flowering of characteristic species occurs in late spring and early summer. The dominant shrub in this community is coyote brush. Common shrub associates observed on the Property include western poison oak, blue blossom (*Ceanothus thyrsiflorus*), and California coffeeberry. The understory consists of cow parsnip (*Heracleum lanatum*), false Solomon's seal (*Smilacina stellata*), bee plant (*Scrophularia californica* ssp. *californica*), California man-root (*Marah fabaceus*), common yarrow (*Achillea millefolium*), and soap plant (*Chlorogalum pomeridianum*). On some north-facing slopes of the Property native tree species, including Douglas fir (*Pseudotsuga menziesii*) and coast live oak (*Quercus agrifolia*), invade this community; while in the Yellow Bank watershed, French broom (*Genista monspessulana*), a non-native, invasive shrub is colonizing highly disturbed areas of coyote brush scrub.

Woodlands and Forests

Five tree-dominated upland communities are found on the Property: central coast live oak woodland, mixed evergreen forest, mixed conifer forest, redwood forest, and eucalyptus/Monterey cypress woodland.

Central Coast Live Oak Woodland. Central coast live oak woodland is distributed from Sonoma County to Santa Barbara County, generally below 3,000 feet. The growing season begins in winter and continues through spring, with a reduction in growth during the summer-fall drought (Holland, 1986). This woodland type occurs as a riparian community along ephemeral stream courses and as an upland community on the hilltop edges of conifer communities on the Property. Coast live oak is the dominant tree intermixed with toyon (*Heteromeles arbutifolia*), tan bark oak (*Lithocarpus densiflorus*), California bay (*Umbellularia californica*), red elderberry (*Sambucus racemosa* var. *racemosa*), California buckeye (*Aesculus californica*), and madrone (*Arbutus menziesii*). Understory species include bedstraw (*Galium aparine*), western poison oak, California blackberry (*Rubus ursinus*), mugwort (*Artemisia douglasiana*), coyote brush, and snowberry (*Symphoricarpos mollis*).

Mixed Evergreen Forest. Mixed evergreen forest is geographically and biologically transitional between the dense coniferous forests of northwestern California and the open woodlands and savannas of the interior (Holland, 1986). Growing season begins in late spring and extends into summer with characteristic species remaining dormant during the winter months. Mixed evergreen forest is more or less continuous from Santa Cruz County northward through the outer Coast Ranges into Oregon, usually away from the immediate coast (200 to 3,000 feet). Small patches of this community extend south through the Santa Lucia Mountains and Santa Barbara County (Holland, 1986). On the Property mixed evergreen forest is found on moist, well-drained slopes with coarse soils in primarily the Liddell, Yellow Bank and Laguna watersheds. Broadleaved trees generally extend from 30 to 90 feet in height often with taller conifers interspersed. Community dominants include coast live oak, madrone, and California bay. Associated species include California buckeye and red elderberry. Coast redwood (*Sequoia sempervirens*), tanoak, Douglas, and canyon live oak (*Quercus chrysolepis*) occur within this community at higher elevations.

Mixed Conifer Forest. Mixed conifer forest occurs primarily on the north-facing slopes of drainages, primarily in the upper watersheds of San Vicente, Liddell, Yellow Bank and Laguna Creeks. Conifers in this plant community include Douglas-fir, coast redwood, Monterey Cypress (*Cupressus macrocarpa*), Monterey pine (*Pinus radiata*) and knobcone pine (*Pinus attenuata*).

Redwood Forest. Redwood forest is regionally abundant from southern San Mateo County through Santa Cruz County (Holland, 1986). Redwood forest occurs primarily on the north-facing slopes of drainages in the San Vicente, Yellow Bank and Laguna Creek watersheds. Redwood is the sole or dominant tree, with Douglas-fir and Monterey pine as associates in most areas. Characteristic understory associates found on the Property include redwood sorrel (*Oxalis*

oregana), elk clover (*Aralia californica*), white trillium (*Trillium, ovatum*), western sword fern (*Polystichum munitum*), and starflower (*Trientalis latifolia*)

Eucalyptus/Monterey Cypress Woodland. This community generally occurs as an ornamental woodland or forest in urban environments. There are no native communities of eucalyptus in California. There are two small natural stands of Monterey cypress forest located outside of the Property: one between Point Cypress and Pescadero Point on the north side of Carmel Bay, Monterey Peninsula and a smaller one near Point Lobos on the south side of Carmel Bay. Monterey cypress and eucalyptus have been widely planted, and have since naturalized, along the coast of California. Blue gum (*Eucalyptus globulus*) and Monterey cypress occur on the Property as dense, isolated stands near urban areas on the site. This is a conspicuous landscape element that was probably originally planted as a windrow. Due to the high acid content of blue gum leaf litter, understory vegetation is inhibited and generally absent or consists of limited exotic grasses.

Riparian Communities

Three riparian communities occur on the Coast Dairies Property: central coast arroyo willow riparian forest, red alder riparian forest, and coast live oak riparian forest.

Central Coast Arroyo Willow Riparian Forest. This community is distributed from Monterey south to Santa Barbara (Holland, 1986). Central coast arroyo willow riparian forest occurs as a dense, broadleafed, winter-deciduous thicket of arroyo willow (*Salix laseolepis*) along most Property creeks, such as Yellow Bank and Ferrari. Arroyo willow is associated with red alder (*Alnus rubra*), California blackberry, rush (*Juncus* spp.), and western sword fern. This community supports very little herbaceous understory due to low light conditions at the soil surface (suppressing seed germination). This early seral community may succeed to any of several riparian woodland or forest types in the absence of flooding disturbance. Central coast arroyo willow riparian forest intermixes with red alder riparian forest on most major creeks on the Property. CDFG defines this community as threatened, with 3,000-10,000 individuals or 10,000-50,000 acres remaining (S3.2).

Red Alder Riparian Forest. Red alder riparian forest is distributed within California along the immediate coast from northernmost San Luis Obispo County to Cape Mendocino, Humboldt County (Holland, 1986). On the Property, red alder riparian forest forms a dense structure along the banks of seasonally saturated and perennial streams, such as Ferrari and San Vicente Creeks. Red alder is strongly associated with big-leaf maple (*Acer macrophyllum*). The understory includes woody and herbaceous plants such as arroyo willow, red elderberry (*Sambucus racemosa* var. *racemosa*), western sword fern, and giant chain fern (*Woodwardia fimbriata)*. CDFG defines this community as threatened, of which 1,000-3,000 individuals or 2,000-10,000 acres remain (S2.2).

Central Coast Live Oak Riparian Forest. In general, this community occurs in canyon bottoms and floodplains of the South Coast and Transverse Ranges, from Sonoma County south to near Point Conception (Holland, 1986). On the Property, coast live oak riparian forest is similar in

species composition to its upland coast live oak forest counterpart. This community is dominated by coast live oak trees. Associated species include western poison oak, California blackberry, mugwort, snowberrry, coyote brush, and red elderberry. CDFG defines this community as threatened, which 3,000-10,000 individuals or 10,000-50,000 acres remain (S3.2).

Wetland and Marsh Communities

Stream Channel. There are seven major perennial streams on the Property, including ScottsCreek (a small portion), Molino Creek, Ferrari Creek, San Vicente Creek, Liddell Creek, Yellow Bank Creek, and Laguna Creek. These streams occur in well defined, steep canyons, and primarily support red alder forest intermixed with central coast arroyo willow riparian vegetation. The upper reaches of San Vicente, Liddell, Yellow Bank, and Laguna Creeks support coast live oak riparian forest.

Freshwater Seep. Seasonal freshwater seeps are commonly found in grasslands at the heads of major creeks and tributaries. Figure 3.1-1 depicts freshwater seeps that were observed on the Property. Freshwater seeps form on soil surfaces underlain by Santa Cruz mudstone (the most abundant geologic type underlying the Coast Dairies Property – see Section 4.2), Santa Margarita sandstone, and Lompico sandstone. These are areas where water is present at or near the ground surface due to relatively permeable, poorly cemented, and friable sandstone formations. The two largest areas of observed seepage occurs in Analysis Zone MS-1 of the Molino watershed near Warnella Road Extension, and at YBW-2 of the Yellow Bank watershed near Liddell Pipeline Road. Dominant species observed in seeps on the Property include sedges (*Carex* spp.), California buttercup (*Ranunculus californicus*), perennial rye-grass (*Lolium perenne*), toad rush (*Juncus bufonius*), brown-headed rush (*Juncus phaeocephalus*) and spikerush (*Eleocharis macrostachya*).

Freshwater seeps are distributed through most regions of California. This community type has been severely restricted in acreage and habitat quality due to water diversion and urban and agricultural land conversions. CDFG defines this community as threatened, with 3,000-10,000 individuals or 10,000-50,000 acres remaining (S3.2).

Freshwater Pond. Several artificial ponds are present in and near creeks and seeps, and serve as water storage facilities throughout the Property. These ponds support primarily California bulrush (*Scirpus californicus*) and cattail (*Typha latif*olia).

Freshwater Marsh. A large freshwater marsh lies at the mouth of Laguna Creek. This marsh primarily supports California bulrush and sedges. Salinity levels may increase at high tide or during periods of low freshwater input from Laguna Creek. This freshwater marsh is similar in description to coastal and valley freshwater marsh as described by Holland (1986).

Urban Development, Disturbed, and Agriculture. Areas of urban development are highly disturbed and consist of residential housing, ornamental trees, landscaping plants, and/or rural vegetable gardens. Areas denoted as disturbed are mostly devoid of vegetation due to past activities such as mining. Agricultural fields are located primarily on coastal terraces adjacent to the Pacific Ocean. Many of these agricultural fields have displaced native plant communities that once included central dune scrub and native grasslands.

3.1.4 WETLANDS

Wetlands are among the most ecologically productive of habitats, supporting a rich array of plant and animal life. They sustain a great variety of hydrologic and ecological functions vital to ecosystem integrity. These functions include flood abatement, sediment retention, groundwater recharge, nutrient capture, and high levels of plant and animal diversity. Wetlands and riparian areas are relatively rare compared to the entire landscape. When wetlands are converted to systems that are intolerant of flooding (drained agricultural lands, filled developed lands), their storage capacity decreases and downstream flooding increases. Modification of even small wetland areas induces effects that are proportionally greater than elsewhere in an ecosystem

Aquatic and riparian systems are the most altered and impaired habitats of California (University of California, Davis, 1996). Wetlands in California have been drained since the earliest settlers attempted to "reclaim" meadows and other wet areas. Meadows were commonly drained with the intent of improving forage conditions and to permit agriculture (University of California, Davis 1996). Development and human alteration have profoundly altered wetland and stream-flow patterns and water temperaturPlanning Teamnd it is estimated that up to 90 percent of California's natural wetlands have been lost (Howell, 1970).

Recognizing the important ecological functions associated with wetlands and the extent to which these systems have been modified and destroyed nationwide, both the federal and state governments have promulgated protective regulations concerning these productive ecosystems. See Section 6.2 for a discussion of wetland regulations and definitions.

3.1.4.1 COAST DAIRIES WETLANDS

Wetland data presented in this section are descriptive in nature. The intent is to provide general descriptions, functions, and values of wetland and water-dependent communities at Coast Dairies. Details concerning actual extent (location on the ground, acreage) and jurisdictional determination are not included herein and are left for more specific planning and implementation documents. The Planning Team found only one documented formal wetland delineation for the Property, for the area immediately adjacent to and north of Highway 1, prepared by the Habitat Restoration Group in 1994 (HRG, 1994).

Riparian Wetlands

Wetlands within the Coast Dairies Property are most commonly riparian in nature and include aquatic, riparian, meadow, and floodplain communities. The riparian zone is the plant community adjacent to a river or stream channel and serves as the interface between the river and the surrounding meadows, floodplain, and upland plant communities. It may be best described as the zone of direct interaction between land and water. Riparian areas are characterized by the combination of high species diversity, high species density, and high productivity. Continuous interactions occur among riparian, aquatic, and upland terrestrial ecosystems through exchanges of energy, nutrients, and species. Compared to other wetland and aquatic types, riparian areas are "open," with large energy, nutrient, and biotic interchanges between aquatic systems on the inner margin and upland terrestrial ecosystems on the upland margin. Riparian ecosystems are further distinguished from other ecosystem types, as described below.

- Riparian ecosystems have a linear form as a consequence of their proximity to rivers, streams, and lakes.
- Energy and material from the surrounding landscape converge and pass through riparian ecosystems in much greater amounts than with any other ecosystem.
- Riparian ecosystems connect upstream and downstream ecosystems.
- Floodwater and subsequent groundwater levels are the main determinants of the type and productivity of the vegetation found in the riparian zone.

Floodwater also brings nutrient-rich sediment to the floodplain, exports organic and inorganic material from the floodplain, and serves as a primary agent for long-term aggregation and degradation of the floodplain.

The diversity and structural complexity of riparian vegetation creates a wide variety of habitats for animals. Both terrestrial and aquatic wildlife depend on riparian ecosystems with their year-round availability of water, nutrients, food sources, and organic matter. In additions to these critical components of food resources, riparian ecosystems provide wildlife with a structural complexity that includes mosaics of shade and sun, shelter, and protected corridors between adjacent plant communities. It is not surprising, that riparian ecosystems are centers of high biodiversity (Rundel and Stuner, 1998).

Riparian communities are among the most impacted on the Property due to the effects of logging and stream diversion, trampling, and placement of above- and below-ground infrastructure, including conveyor belts, dams, bridges, and pipelines.

Wetland Classes

Specific wetland classes identified on the Property include riverine (rivers, creeks, and streams), palustrine (shallow ponds, marshes, swamps, sloughs), and lacustrine (lakes and deep ponds).

Using the Cowardin classification, specific wetland and deepwater classes within the Property ecosystem include:

- **Riverine upper perennial** – seven major creeks (ScottsCreek [a small portion], Molino Creek, Ferrari Creek, San Vicente Creek, Liddell Creek, Yellow Bank Creek, and Laguna Creek);

- **Palustrine emergent** – emergent wetland (marsh, meadow) habitat underlain by Santa Cruz mudstone, Santa Margarita sandstone, and Lompico sandstone;

- **Palustrine forest** - the riparian forest habitats along the most of the major creeks and their tributaries subject to various flooding regimes; and

- **Palustrine scrub shrub** – riparian scrub (e.g., willow) habitat along the Merced River and South Fork along the lower reaches of six major creeks (San Vicente Creek, Ferrari Creek, Liddell Creek, Yellow Bank Creek, and Laguna Creek) and their tributaries subject to various flooding regimes.

The following discussion provides general descriptions for each wetland class identified as occurring on the Property.

Riverine Upper Perennial

Riverine upper perennial habitat within the Property includes the open and flowing water of the seven major creeks, including Scotts Creek (a small portion), Molino Creek, Ferrari Creek, San Vicente Creek, Liddell Creek, Yellow Bank Creek, and Laguna Creek. It is the permanently flooded rock-, cobble-, or sand-bottom channel with little to no in-stream vegetation. Occasional sandbars form within and at the channel edge and typically support willows and emergent (grasses and herbs) vegetation. Based on the Cowardin classification system, the majority of the creeks would be classified as wetland. Channel portions that lie at a depth of 2 meters below low water would be considered deepwater. These creeks would likely be considered as waters of the United States by the U.S. Army Corps of Engineers, and their status would be subject to jurisdiction under Section 404 of the Clean Water Act.

Palustrine Emergent

Palustrine emergent habitat includes grassland meadows and freshwater seeps. Soils generally remain saturated year-round or on a seasonal basis. Vegetation is dominated by grasses, sedges, rushes, and perennial herbs. These communities are typically considered wetlands under both the Cowardin classification system and U.S. Army Corps of Engineers wetland definition.

Palustrine Forest

Palustrine forests are found along the most of the major creeks and their tributaries on the Property. In the upper reaches of Coast Dairies' watersheds these are primarily coast live oak riparian forest. For example along San Vicente Creek, where the creek is broad, shallow, and

slow-moving, California bay, willows, and coast live oak dominate the riparian corridor. Substrate under the palustrine forest community varies from rock, gravel, sand, clays, loams, and mud. Palustrine forests are classified as wetlands based on the Cowardin classification system. These areas are classified as either wetland or nonwetland waters of the United States by the U.S. Army Corps of Engineers, depending on site-specific vegetation, soils, and hydrologic conditions.

Palustrine Scrub Shrub

Palustrine scrub shrub is found in the riparian corridor along the lower reaches of the six major creeks (San Vicente, Ferrari, Liddell, Yellow Bank, and Laguna) and their tributaries, and is regularly inundated by normal high-water or flood flows. This habitat is dominated primarily by red alder forest intermixed with central coast arroyo willow riparian vegetation and often intergrades with grassland meadow and freshwater seep (palustrine emergent) and riparian (palustrine forest) communities. These communities are typically classified as wetlands under both the Cowardin Classification system and U.S. Army Corps of Engineers classification systems.

3.1.5 SPECIAL STATUS PLANT SPECIES

As discussed below, a number of species known to occur on or in the vicinity of the Coast Dairies property are accorded "special status" because of their recognized rarity or vulnerability to various causes of habitat loss or population decline. Some species are formally listed and receive specific protection defined in federal or state endangered species legislation. Other species have no formal listing status as threatened or endangered, but are designated as “rare” or “sensitive” on the basis of policies adopted by federal or state resource agencies, by local governmental agencies such as counties, cities, and special districts to meet local conservation objectives, or by organizations with acknowledged expertise such as the California Native Plant Society. These species are referred to collectively as "special status species" in this ECR, following a convention that has developed in practice but has no official sanction. See Section 6.1 for a discussion of special status species regulatory mechanisms.

3.1.5.1 SPECIAL STATUS PLANT SPECIES AND COAST DAIRIES

A list of special status plant species reported to occur on or within the vicinity of the Coast Dairies Property was compiled on the basis of data in the CNDDB (1999), CNPS Electronic Inventory (1999), and a review of regional botanical literature and previous site surveys (Amme D., 1999; Bonny Doon Quarries Revegetation and Reclamation Plan, 1996; CNPS Field Survey, 2001; Habitat Restoration Group, 1994; Josselyn et al., 1994; Willis pers. comm., 2001). A total of 55 special status plant species were identified as having the potential to occur on the Property. Listing status, general habitat, and nearby occurrences for these species are summarized in Table 3.1-2. Of these, eleven are either federally or state listed as threatened or endangered. These species will be discussed further in the next section. Fifteen species are considered Species of Special Concern by USFWS or CDFG, eight are CNPS List 1B species, and 21 are CNPS List 2, 3, or 4 species or are considered locally rare.

The following discussion presents a summary of survey results to date. Botanical surveys were completed by Planning Team botanists in October 2000 and on February 16, March 21, April 1 and 14 (with members of CNPS), and April 25, 2001. Surveys were comprehensive but it is highly likely that new species will be discovered on the property in the coming years. Plant surveys were floristic in nature, identifying every species to the point that its rarity could be confirmed or denied (see the Project Archives for a full list of plant species identified on-site). Certain special status species were eliminated from further consideration due to lack of available habitat(s) on the Coast Dairies property. Special status plant species that typically occur in habitats present on the Property that were not found during surveys are presumed present on the site. These species will remain "presumed present" within suitable habitats on the property until survey data prove otherwise.

To date, three special status species have been found during surveys conducted on the Property by Planning Team botanists and previous investigators (see Table 3.1-2). Santa Cruz clover (*Trifolium buckwestiorum*) is a CNPS List 1B species, and common muilla (*Muilla maritima*) and Michael's rein orchid (*Piperia michaelii*) are designated as locally rare.

3.1.5.2 FEDERAL AND STATE LISTED SPECIES WITH THE POTENTIAL TO OCCUR ON THE COAST DAIRIES PROPERTY

Based on an examination of general distribution and habitat requirements, as well as an assessment of available habitat on the Property, the following federal or state listed threatened and endangered species were determined to have a medium to high potential for occurrence on the Coast Dairies property.

Monterey Spineflower (Chorizanthe pungens var. pungens)

Species Status, Description and Habitat Requirements

Monterey spineflower is listed as federally threatened. A prostrate member of the knotweed family (Polygonaceae), this species flowers from April to June. Its perianth is white to rose and the involucral tube surrounding the flower has papery margins that are white to purple, with hooked awns on the tip of each lobe. Monterey spineflower is found in coastal strand, coastal dune, and coastal scrub habitat along the more northerly regions of California's central coast and in the coastal portions of the San Francisco Bay Area.

TABLE 3.1-2
SPECIAL STATUS PLANT SPECIES REPORTED TO OCCUR WITHIN THE VICINITY OF THE COAST DAIRIES PROPERTY

Common Name	Listing Status (USFWS/CDFG)	General Habitat	Site Occurrence
		FEDERAL OR STATE LISTED SPECIES	
Ben Lomond spineflower *Chorizanthe pungens var. hartwegii*	FE / - / List 1B	Zayante coarse sands in maritime ponderosa pine sandhills	Habitat not found on-site. Nearest known location--Bonny Doon Ecological Preserve.
Monterey spineflower *Chorizanthe pungens var. pungens*	FT/ - /List 1B	Coastal dunes and scrub	Not found on-site to date.
Scott's Valley spineflower *Chorizanthe robusta var. hartwegii*	FE/ - /List 1B	Xeric or sandy meadows or grasslands on mudstone or Purisima outcrops	Not found on-site to date.
Robust spineflower *Chorizanthe robusta var. robusta*	FE / - / List 1B	Sandy terraces and bluffs within cismontane woodlands, dunes or scrub	Not found on-site to date. Nearest documented location is Pogonip.
Santa Cruz cypress *Cupressus abramsiana*	FE / CE / List 1B	Closed cone coniferous forests on sandstone or granite derived soils	Not found on-site to date. Nearest documented location is north of Bonny Doon between Pine Flat Road and Martin Road – known from fewer than 10 occurrences in the Santa Cruz Mountains.
Santa Cruz (Ben Lomond) wallflower *Erysimum teretifolium*	FE / CE / List 1B	Chaparral or coniferous forests on inland marine sands	Not found on-site to date. Located within the Bonny Doon Ecological Preserve.
Santa Cruz tarplant *Holocarpha macradenia*	FT / CE / List 1B	Coastal prairie or grasslands (often associated with clays)	Not found on-site to date. Suitable habitat includes less disturbed grasslands of upper terraces.
White-rayed pentachaeta *Pentachaeta bellidiflora*	FE / CE / List 1B	Open dry rocky slopes and grassy areas – often on soils derived from serpentine	No serpentine soils on-site. Nearest reported occurrece for this species is on hillsides located above San Lorenzo Creek.
San Francisco popcorn-flower *Plagiobothrys diffusus*	FSC / CE / List 1B	Coastal prairie and grasslands	Not found on-site to date. Nearest known location is on the Bombay property.
Hickman's potentilla *Potentilla hickmanii*	FE /CE / List 1B	Coastal bluffs and scrub, mesic meadows, seeps, and marshes	Not found on-site to date.
Tidestrom's lupine (Clover Lupine) *Lupinus tidestromii*	FE / - / List 1B	Coastal strand, dune and other coastal habitats	Not found on-site to date.

TABLE 3.1-2 (CONTINUED)
SPECIAL STATUS PLANT SPECIES REPORTED TO OCCUR WITHIN THE VICINITY OF THE COAST DAIRIES PROPERTY

Common Name	Listing Status (USFWS/CDFG)	General Habitat	Site Occurrence
		FEDERAL OR STATE SPECIES OF CONCERN	
Blasdale's bent grass *Agrostis blasdalei*	FSC / CR / List 1B	Sandy or gravelly soils close to rocks with sparse vegetation	Ploughed and disturbed site 1.8 miles southeast of Swanton Road and Highway 1, west of Highway 1.
Santa Cruz manzanita *Arctostaphylos andersonii*	FSC / - / List 1B	Chaparral and coniferous forests – often associated with redwoods	Not found on-site to date. Nearest known locations are Pine Flat road in Bonny Doon and at the summit of Empire Grade – known from fewer than 15 occurrences in the Santa Cruz Mountains.
Schreiber's manzanita *Arctostaphylos glutinosa*	FSC / - / List 1B	Chaparral and coniferous forests underlain by diatomaceous shale outcrops – often associated with *Pinus attenuata*	Not found on-site to date. Nearest known locations are between Mill Creek and ScottsCreek ½ mile northeast of Seaside School and at Ben Lomond – known from fewer than 10 occurrences.
Pajaro manzanita *Arctostaphylos pajaroensis*	FSC / - / List 1B	Chaparral – only in Monterey and Santa Cruz Counties (may be extinct in Santa Cruz County)	Nearest documented location is 2.5 miles southeast of Eagle Rock along Ice Cream Grade north of Bonny Doon.
Bonny Doon manzanita *Arctostaphylos silvicola*	FSC / - / List 1B	Chaparral and coniferous forests underlain by inland marine sands	Nearest documented location is Bonny Doon Ecological Reserve – known from fewer than 20 occurrences.
Ben Lomond spineflower *Chorizanthe pungens var. hartwegiana*	FSC / - / List 1B	Marine ponderosa pine sandhills	Habitat has not been found on-site.
San Francisco gumplant *Grindelia hirsutula var. maritima*	FSC / - / List 1B	Coastal bluff scrub and grasslands – often associated with serpentine or sandy soils or rock outcrops	Not found on-site to date.
Kellogg's horkelia *Horkelia cuneata ssp. sericea*	FSC / - / List 1B	Coastal scrub and closed cone pine forests	Not found on-site to date.
Point Reyes horkelia *Horkelia marinensis*	FSC / - / List 1B	Coastal dunes, coastal terrace prairie and coastal scrub	Not found on-site to date. Known from fewer than 20 occurrences.
Smooth lessingia *Lessingia micradenia var. glabrata*	FSC / - / List 1B	Chaparral and cismontane woodland – generally associated with serpentine soils or road cuts	Not found on-site to date. Known from only 11 occurrences. Serpentine does not occur on-site.

TABLE 3.1-2 (CONTINUED)
SPECIAL STATUS PLANT SPECIES REPORTED TO OCCUR WITHIN THE VICINITY OF THE COAST DAIRIES PROPERTY

Common Name	Listing Status (USFWS/CDFG)	General Habitat	Site Occurrence
Gairdner's yampah *Perideridia gairdneri ssp. gairdneri*	FSC / - / List 1B	Dry bluffs and slopes of the Monterey Penninsula	Nearest documented location is ScottsCreek near Swanton
Scott's Valley polygonum *Polygonum hickmanii*	FSC / - / List 1B	Annual grassland and wildflower fields occurring on fine-textured, shallow, well drained soils over outcrops of Santa Cruz mudstone and Purisima sandstone	Not found on-site to date. Thought to be restricted to two sites in Scott's Valley.
Monterey pine *Pinus radiata*	FSC / - / List 4	Mesic places within broadleaved upland forests, chaparral, and grasslands	Only 3 native stands occur in California at Ano Nuevo, Cambria and the Monterey Peninsula.
San Francisco campion *Silene verecunda ssp. verecunda*	FSC / - / List 1B	Coastal scrub and grasslands	Located approximately 2/3 mile south of Swanton Road and 1/3 mile east of Highway 1.
Santa Cruz microseris *Stebbinsoseris decipiens*	FSC / - / List 1B	Open areas in loose or disturbed soil (generaly sandstone) on seaward slopes within broadleaved upland forests and coastal prairie	Not found on-site to date. Nearest locations are approximately 2 miles northwest of the Big Creek Fire Station and at the confluence of ScottsCreek and Mill Creek.
		OTHER SPECIAL STATUS SPECIES	
Bent-flowered fiddleneck *Amsinkia lunaris*	- / - / List 1B	Coastal bluff scrub, cismontane woodland and grasslands below 500 meters in elevation	Not found on-site to date.
San Francisco collinsia *Collinsia multicolor*	- / - / List 1B	Coastal scrub and woodlands	Not found on-site to date. Known from only a few populations in Santa Cruz County.
Loma Prieta hoita *Hoita strobilina*	- / - / List 1B	Chaparral, cismontane woodland and riparian woodlands – generally associated with mesic serpentine sites	Not found on-site to date. Serpentine does not occur on-site.
Marsh microseris *Microseris paludosa*	- / - / List 1B	Closed cone coniferous forests, cismontane woodland, coastal scrub, and grasslands	Not found on-site to date.
Ben Lomond buckwheat *Enogonum nudum var. decurrens*	- / - / List 1B	Chaparral and woodlands – especially maritime ponderosa pine sandhills	Not found on-site to date.
Santa Cruz Mountains beardtongue *Penstemon rattanii var kleei*	- / - / List 1B	Sandy shale slopes often in the transition from forest to chaparral	Not found on-site to date. Nearest locations are between Mill Creek and ScottsCreek and at Ben Lomond – known from fewer than 10 occurrences.

TABLE 3.1-2 (CONTINUED)
SPECIAL STATUS PLANT SPECIES REPORTED TO OCCUR WITHIN THE VICINITY OF THE COAST DAIRIES PROPERTY

Common Name	Listing Status (USFWS/CDFG)	General Habitat	Site Occurrence
Maple-leaved checkerbloom *Sildalcea malachroides*	- / - / List 1B	Woodlands and clearings near the coast – often in disturbed areas	Not noted from Santa Cruz County since 1932.
Santa Cruz clover *Trifolium buckwestiorum*	- / - / List 1B	Margins of broadleaved upland forests and coastal prairie	Located in a shallow depression near the Purdy aluminum barn in the vicinity of Swanton within the ScottsCreek Watershed.
		LOCALLY RARE SPECIES	
Reedgrass *Calamagrostis nutkaensis*	- / - / - (locally rare)	Wet areas of beaches, dunes or coastal woodlands	Not found on-site to date.
Large-flowered star tulip *Calochortus uniflorus*	- / - / - (locally rare)	Moist meadows	Not found on-site to date.
Santa Cruz Mountains pussypaws *Calyptridium parryi var. hesseae*	- / - / List 3	Chaparral and cismontane woodland	Not found on-site to date.
Johnny nip *Castilleja ambigua*	- / - / - (locally rare)	Coastal bluffs, salt marshes, and grasslands below 150 meters in elevatiaon	Not found on-site to date.
Purple owl's-clover *Castilleja exserta latifolia*	- / - / - (locally rare)	Coastal bluffs and dunes	Not found on-site to date.
California bottle-brush grass *Elymus californicus*	- / - / List 4	Coniferous forests	Not found on-site to date.
San Francisco wallflower *Erysimum franciscanum*	- / - / List 4	Coastal dunes, scrub and grasslands – often associated serpentinite or granitic soils	Not found on-site to date.
Large-flowered linanthus *Linanthus grandiflorus*	- / - / - (locally rare)	Open grassy flats – generally associated with sandy soils	Not found on-site to date.
Linanthus *Linanthus parviflorus*	- / - / - (locally rare)	Open or wooded areas	Not found on-site to date.
Mount Diablo cottonweed *Micropus amphibolus*	- / - / List 3	Coastal bluffs, grasslands and cismontane woodlands	Not found on-site to date.

TABLE 3.1-2 (CONTINUED)
SPECIAL STATUS PLANT SPECIES REPORTED TO OCCUR WITHIN THE VICINITY OF THE COAST DAIRIES PROPERTY

Common Name	Listing Status (USFWS/CDFG)	General Habitat	Site Occurrence
Santa Cruz County monkeyflower *Mimulus rattanii ssp. decurtatus*	- / - / List 4	Margins of chaparral and coniferous forests	Not found on-site to date.
Common muilla *Muilla maritima*	- / - / - (locally rare)	Grasslands, open scrub and woodlands – often associated with alkaline, granitic, or serpentine soils	Occurs on shallow soils on upper terraces in YBS-1
Rein orchid *Piperia elegans*	- / - / - (locally rare)	Generally dry open sites in coniferous forests or coastal scrub	Not found on-site to date.
Michael's rein orchid *Piperia michaelii*	- / - / List 4	Coastal bluff scrub, woodlands and coniferous forests	Observed on-site at unknown location.
Choris's popcornflower *Plagiobothrys chorisianus*	- / - / List 3	Mesic areas within chaparral, coastal scrub and coastal terrace prairie	Not found on-site to date.
Erect plantain *Plantago erecta*	- / - / - (locally rare)	Sandy, clayey or serpentine soils within grasslands or woodlands	Not found on-site to date.
Round woolly marbles *Psilocarphus tenellus globiferus*	- / - / List 4	Meadows and seasonally mesic portions of grasslands	Not found on-site to date.
Gray's clover *Trifolium (barbigerum andrewsii) grayii*	- / - / - (locally rare)	Wet meadows and slopes to coniferous forests	Not found on-site to date.
Clover *Trifolium appendiculatum*	- / - / - (locally rare)	Mesic sites in grasslands	Not found on-site to date.
Death camas *Zygadenus fontanus*	- / - / - (locally rare)	Grassy or wooded slopes – often associated with rock outcrops	Not found on-site to date.
Fremont's death camas *Zygadenus fremontii minor*	- / - / - (locally rare)	Grassy or wooded slopes – often associated with rock outcrops	Not found on-site to date.

STATUS CODES:

FEDERAL: (U.S. Fish and Wildlife Service)

FE=Listed as Endangered by the Federal Government
FT = Listed as Threatened by the Federal Government
FSC=Federal Species of Concern

STATE: (California Department of Fish and Game)

CE=Listed as Endangered by the State of California
CR = Listed as Rare by the State of California

STATUS CODES (continued):

California Native Plant Society

List 1B=Plants rare, threatened, or endangered in California and elsewhere
List 2= Plants rare, threatened, or endangered in California but more common elsewhere
List 3= Plants about which more information is needed
List 4= Plants of limited distribution

Scott's Valley Spineflower (*Chorizanthe robusta* var. *hartwegii*)

Species Status, Description and Habitat Requirements

Scott's Valley spineflower, an annual herb endemic to California, is a federally endangered species and is also a CNPS List 1B plant. This spineflower has rose-pink involucral margins confined to the basal portion of the teeth and an erect habit. Flower heads are medium in size (1 to 1.5 cm) and distinctly aggregate. The plant is endemic to the central California coast region and limited to Purisima sandstone and Santa Cruz mudstone. It is known from Scott's Valley in the Santa Cruz Mountains. Where the species occurs on Purisima sandstone, the bedrock is overlain with a thin, sandy soil layer that supports a meadow community comprised of herbs and low-growing grasses. The species can also be found in coastal scrub habitat. Numbers of this annual plant are expected to fluctuate from year to year, depending on climatic conditions.

Robust Spineflower (Chorizanthe robusta var. robusta)

Species Status, Description and Habitat Requirements

Robust spineflower is listed as federally endangered and also as a CNPS List 1B species. This species is similar in appearance to Scott's Valley spineflower but its stems tend to be decumbent rather than erect. It also lacks the pink involucral margins described above. Robust spineflower is found on sandy terraces and bluffs within cismontane woodlands or in coastal dune and scrub habitat. The nearest documented location for this species is in Pogonip.

Santa Cruz (Ben Lomond) Wallflower (*Erysimum teretifolium*)

Species Status, Description and Habitat Requirements

Santa Cruz or Ben Lomond wallflower is listed as endangered on both the federal and state levels, as well as designated a CNPS List 1B species. The species is a biennial, or occasionally an annual, belonging to the mustard family (Brassicaceae). Seedlings form a basal rosette of leaves. These leaves wither as the main stem develops flowers, which are clustered in a terminal raceme. The flowers are a deep yellow with petals 1.3 to 2.5 cm long; the fruit is a slender capsule that reaches 10 cm in length and is covered with three-parted hairs. Herbage is a dull purplish color. The leaves are simple and narrowly linear, a characteristic that separates this plant from other wallflowers. This wallflower is endemic to sandstone deposits in the Santa Cruz Mountains and is presently known from only a dozen scattered occurrences, seeming to prefer sites with loose,

uncompacted sand in openings between scattered chaparral shrubs. The nearest documented occurrence is from Bonny Doon Ecological Preserve.

Santa Cruz Tarplant (*Holocarpha macradenia*)

Species Status, Description and Habitat Requirements

Listed by California as endangered, as federally threatened, and by CNPS as a List 1B species, the Santa Cruz tarplant is a rigid, glandular annual ranging from 1 to 5 decimeters in height. Because it occurs in colonies, it is easily observed, especially when it produces its yellow flowers between June and October. The key characteristics for the genus are: (1) the phyllaries enclose the ray flowers; and (2) the phyllaries and upper leaves are covered with stalked glands. The species is recognized by its black anthers and large number (40 to 90) disk flowers. It inhabits grassy flats underlain by heavy soils along the coast, and has been observed in Alameda, Contra Costa, Marin, Santa Cruz and Monterey Counties. CNPS reports that the species is threatened by urbanization, agriculture, non-native plants, and lack of appropriate ecological disturbance. Reports in 1993 from Santa Cruz indicate that the only populations maintaining themselves are those exposed to grazing.

White Rayed Pentachaeta (*Pentachaeta bellidiflora*)

Species Status, Description and Habitat Requirements

This species is federally and state listed as endangered and is also on CNPS List 1B. This small (2 to 8 inches) annual of the sunflower family has 5 to 16 white or purple tinged ray flowers, with a hairy stem and leaves and flowers March to May. The species often occurs on serpentine derived soils and has been found in the serpentine grasslands inland from Coast Dairies but Munz (1970) reports that it also occurs in northern coastal scrub and coastal prairie grassland. The nearest reported occurrence of this species is at San Lorenzo Creek.

San Francisco Popcorn Flower (*Plagiobothrys diffusus*)

Species Status, Description and Habitat Requirements

San Francisco popcorn flower is listed by the state as endangered, by the USFWS as a species of special concern, and by CNPS as a List 1B species. It is generally found in coastal prairie and grassland habitats. Its nearest documented location is on the Bombay property to the south of Coast Dairies. This species is currently known from fewer than ten occurrences throughout its range.

Hickman's Potentilla (*Potentilla hickmanii*)

Species Status, Description and Habitat Requirements

This species is on CNPS List 1B, state endangered, and federally proposed as endangered. This yellow flowered perennial herb, a member of the rose family (Rosaceae), occurs in northern

coastal scrub, closed-cone pine forest, freshwater wetlands, and meadows and seeps. There are no documented occurrences of this species on the Coast Dairies Property, but suitable habitat does exist. The closest site with known occurrences of this potentilla was documented north of Moss Beach at Half Moon Bay.

Tidestrom's Lupine (*Lupinus tidestromii*)

Species Status, Description and Habitat Requirements

A federally endangered and CNPS List 1B species, Tidestrom's lupine belongs to the pea family (Fabaceae). This is a creeping perennial with a rhizomatous root system and white, shaggy herbage. This lupine's blue to lavender flowers appear from May to June. The species is found in beach and dune habitat and its known distribution is limited to dunes systems in Sonoma, Marin, and Monterey Counties.

3.1.6 ISSUES

3.1.6.1 ISSUES IDENTIFIED BY THE CITIZENS ADVISORY GROUP

Prior to the formation of the Planning Team, the Trust for Public Land was assisted in its early project scoping by members of the Community Advisory Group (CAG). In order to deal specifically with natural resource issues, a subcommittee of the CAG was tasked with identifying habitat preservation and enhancement concerns. The instructions for the subcommittee were to identify critical/sensitive habitats and their locations, and to discuss the special needs of each. The group did not find it appropriate at that point in the process to produce detailed maps or species lists, since it was assumed that the Planning would grapple with that level of analysis in the ECR. Rather, the group chose to identify missing pieces of information they felt necessary to have before evaluating any areas of concern and general resource management topics. The subcommittee presented to TPL a summary of an April 24, 2000 meeting, which listed the following priorities relevant to botanical resources:

- evaluating native plant species for re-introduction;
- rehabilitating mined areas; and
- establishing ongoing research programs for livestock grazing and similar uses.

These issues will be evaluated during the planning process for the Property.

3.1.6.2 NON-NATIVE PLANT SPECIES

Prior to the arrival of the first European settlers, the California landscape was made up of a variety of ecosystems, including prairies, oak woodlands, and wetlands. These ecosystems were home to abundant birds, butterflies and other animals. Increasingly, few acres of these original landscapes remain. Most of these areas have been transformed into the agricultural lands, urban

centers, and industrial sites we see today. After European settlement, people planted gardens with plants brought from their home country. Gardens were tiny, comfortable plots set in a huge wilderness. Today, however, the reverse is true. Agricultural and garden plants introduced from all over the world dominate the landscape, while native plants are managed in small preserves.

Native plants (also called indigenous plants) are plants that have evolved over thousands of years in a particular region. They have adapted to the geography, hydrology, and climate of that region. Native plants occur in communities, that is, they have evolved together with other plants, as well as animals. As a result, a community of native plants provides habitat for a variety of native wildlife species such as songbirds and butterflies.

Non-native plants (also called non-indigenous plants, invasive plants, exotic species, or weeds) are plants that have been introduced into an environment in which they did not evolve. Introduction of non-native plants into our landscape has been both accidental and deliberate. Purple loosestrife, for example, was introduced from Europe in the 1800's in ship ballast and also as a medicinal herb and ornamental plant. It quickly spread and can now be found in 42 states.

In general, aggressive, non-native plants have no enemies or controls to limit their spread. As they move in, complex native plant communities, with hundreds of different plant species supporting wildlife, are often simplified. Most native plant species disappear, resulting in a reduction in diversity and plant populations dominated by non-native species. In the most extreme cases, a monoculture made up of a single non-native species completely replaces native diversity.

For example, French broom colonizes grassland and scrub areas, replacing native plants unable to compete for available sunlight, water, and nutrients. Areas infested with French broom can lose as much as 90 percent of their original native plant populations. This limits the variety of food and cover available to birds and may cause some to move or disappear from a region altogether. Non-native and invasive plants of concern on the Property include French broom, pampas grass (*Cortaderia jubata*), purple star thistle (*Centaurea melitensis*), yellow star thistle (*Centaurea solstitialis*), cape ivy (*Delairea odorata*), hemlock (*Conium maculatum*), and fennel (*Foeniculum vulgare*). Infestations of broom and pampas grass are centered around areas of mining activity, while populations of star thistle are commonly associated with agricultural or grazing lands.

Species that are native to California are considered non-native when they occur in areas that they did not occupy historically, before the advent of Europeans and large scale landscape disturbance. Two species found on the Property that belong in this category are Monterey pine (*Pinus radiata*) and Monterey cypress (*Cupressus macrocarpa*). Native stands of these species are highly limited in distribution, although they have been extensively planted worldwide. Native stands of Monterey pine occur at Ano Nuevo to the north of the Property, and Monterey to the south. The natural limits of distribution for this species are difficult to determine, since it has been planted throughout California and naturalizes easily. However, there is no documentation of native stands at Coast Dairies and there is no evidence that they occurred there historically. Natural stands of Monterey cypress are limited to two areas in Monterey County, to the south of the Property. This species has also been widely planted throughout California and naturalizes readily. When these

species occur under favorable conditions, in areas where they are not native, they can pose a serious threat to native plant communities, invading grasslands, coastal scrub and oak woodlands, for example, and converting them to monotypic forests. Monterey pine and Monterey cypress have both been observed in mixed conifer and redwood forest on the Property.

3.1.6.3 FERAL PIGS

Wild (feral) pigs (*Sus scrofa*) occur on the Coast Dairies property and regularly damage (by rooting) areas of native vegetation. Approximately 30-acres of fresh pig disturbance is evident at any one time on the Property (Smith pers. comm., 2000). Pig damage over-turns soils and removes cover vegetation, increasing the potential for erosion and invasion of exotic plant species. Refer to Section 3.2.6.3 for additional discussion concerning feral pigs.

3.1.6.4 LIVESTOCK GRAZING

The Coast Dairies grazing program is described in Section 4.2 and can be found in the Project Archives. The report describes a program that grazes extensively but with defensible stocking rates, at least by conventional grazing assessment methods. Problems with livestock distribution, fencing, water availability, and purple star thistle infestation suggested to the author of the grazing program (David Amme) that a more complex, rigorously administered system of smaller pastures and more controlled rotation would improve the situation.

3.1.6.5 PLANT PATHOGENS

The following provides general information on major plant pathogens of concern for the Property. Although not confirmed, it is suspected that some trees on-site are currently affected by sudden oak death syndrome and pine pitch canker.

Sudden Oak Death Syndrome

Throughout California's coastal counties tanoaks (*Lithocarpus densiflorus*), coast live oaks (*Quercus agrifolia*) and black oaks (*Quercus kelloggii*) are dying in large numbers from sudden oak death syndrome (SOD) – an infestation of *Phytophthora* fungus. At this time it is unknown whether the fungus was recently introduced into California or if it is a native and has only recently increased in importance as a tree-killer. SOD was first seen on tanoak in Mill Valley (Marin County) in 1995. Since then, elevated levels of oak mortality have been reported as far north as Humboldt County and as far south as Monterey County. To date only seven counties have been confirmed as infested: Marin, Napa, Sonoma, San Mateo, Santa Clara, Santa Cruz and Monterey Counties. Of the currently known affected areas, three counties show particularly elevated levels of mortality - Marin, Santa Cruz and Monterey.

The unprecedented level of dieback of tanoak, coast live oak, black oak poses several immediate and future environmental threats. Dead and dying oaks have worsened the already severe fire hazard conditions in both wildland and developed hillside areas. Many wildlife species depend on

these major acorn-bearing trees for forage and habitat. In addition, oaks are highly valued trees in urban settings, providing beauty, shade and property value to homes, and the loss of these trees can be both aesthetically and financially costly.

A consistent suite of symptoms have been identified in tanoak, coast live oak and black oak; the three species of trees currently known to be affected. Although symptoms are similar in these species, their appearance, both chronologically and physically, show some variation. In tanoak, leaf symptoms are usually the first to appear. New growth may droop or turn yellow to brown. Droop occurs on most or all of the crown, rather than in a localized area. In coast live oak and black oaks the earliest symptom is the appearance of a bleeding canker, burgundy-red to tar-black thick sap oozes on the bark surface. Similar bleeding is also seen on tanoak.

At this time there is no known cure for trees with symptoms of SOD. While anti-fungals can be applied to individual trees in an urban setting, there is no feasible treatment for trees in a woodland setting. Widescale use of chemicals in these environments is undesirable due to known and unknown negative impacts on native ecosystems. It is hoped that some trees will be resistant to, or tolerate, the pathogenand thus may escape infection.

Pine Pitch Canker

Pitch canker attacks several species of pine and is caused by the fungus *Fusarium moniliforme.* Cankers usually develop on the main trunk but can occur on lateral branches. Copious resin flows from trunk cankers and wood beneath cankers becomes resin soaked. It is expected that up to 25 percent of coastal California native and ornamental Monterey pine trees will be lost over the next 10 years due to pitch canker.

Annosus Root Rot

Annosus root disease is a widespread native fungus (*Heterobasidion annosum*). Symptoms of this fungal disease are stunted needle growth, thinning of needles in the crown and eventual death. Roots and butt of stems exhibit a soft, stringy white rot. The fungus may produce perennial conks or fruiting bodies at the base of the tree. The conks vary in shape from a bracket to flat layers. These are gray-brown to dark brown on the upper surface, creamy white underneath, and usually are not casually visible due to covering by needle accumulations. In pines, the fungus first spreads through the root system, attacking the inner bark and sapwood, killing these tissues. Within two to six years after initial infection, the fungus reaches the root crown and girdles the tree. The tree dies, but the fungus remains active as a saprophytic, wood-decaying organism within roots and the butt of the dead tree. Pines weakened by annosus root disease are often killed by bark beetles. Incense-cedars, however, are not affected by beetles and will stand green for many years until the disease finally weakens the structure enough to cause failure. Cedars are thought to act as a reservoir for annosus root disease because they take so long to die.

Fusiform Rust

Fusiform Rust (*Cronartium fusiforme*) is fungus disease with alternate reproductive stages on pine and oak. Symptoms on pine are spherical, oblong or linear swellings or galls on branches or trunks. Swellings on trunks may develop into open cankers. Galls rupture in early spring releasing masses of orange spores that infect developing oak leaves.

3.1.6.6 FIRE HISTORY AND FIRE ECOLOGY

Fire History

Greenlee (1983) studied fire history and ecology in the Santa Cruz Mountains, with particular emphasis on Big Basin Redwoods State Park, which lies about 12 miles north of the Property and several miles inland. Fire history from dated scars on redwoods at that location indicate Native American era fires in AD 1420, 1497, 1514, 1550, and 1631; Spanish and Mexican-American era fires occurred in 1671, 1753, 1853 and 1874.

Early accounts suggest that fall wildfires were frequent on the North Coast as well. Beginning with Father Crespí's description (see Section 1.2.2) of the coastal terrace being burned over by the Indians in 1769, there are references to fire scattered throughout the historical record. The practice of burning off the grasslands in the fall to encourage new growth carried into the Spanish period and occurred often enough that the Governor of Alta California found it necessary to issue an order in 1815 to prevent the practice of burning "so that new pasture grass grows" because of the danger it posed to nearby settlements. The fine for doing so was ten pesos (Branciforte, 1815).

In October of 1840, while sailing northward between Monterey and San Francisco, Captain William Dane Phelps of the ship *Alert* described the North Coast ablaze while off Año Nuevo: "*The mountains on fire and the Forests in the Valleys in a broad sheet of flame & presenting during the night a spectacle sublime & awful."* (Phelps, 1983) The tradition of setting fires on the North Coast passed to the loggers when they entered the mountains in the 1850s. It was the practice of loggers to burn off the waste materials (called "slash") after felling redwood trees to clear the forest floor and make it easier to move the logs out to the mills. As long as the mountains were sparsely settled, the fires were allowed to burn across the mountains. In October of 1861, the *Santa Cruz Sentinel* noted the entire range on fire from Soquel to Pescadero, a distance of forty miles: "*The smoke arising from the conflagration hangs like a dark pall over the whole chain of mountains as far as the eye can reach, and impregnates the atmosphere…last evening the red, glaring light of the fire, seen flashing high up in the air, and the reflection on the sky above, giving a livid, glowing appearance, presented a view fearfully grand and picturesque…These fires are periodical with us, and to go through the forests and see the large trees charred and blackened, one cannot but lament the cause that has robbed us of so much of our wealth."*(*Sentinel* 10/10/1861)

The increasing number of loggers in the woods combined with periodic dry years meant more fires. A huge fire in August of 1873 began beside a small mill on Scotts Creek and then roared northeast, eventually reaching Boulder Creek on the other side of Ben Lomond Mountain.

"*It was destroying everything combustible in its course, even large green redwood trees were consumed, together with wood, tan-bark, fencing and all fallen timber. Mr. Smith Comstock & Bro. lost 300 cords of bark, and smaller amounts were lost belonging to numerous other parties. It is estimated that over $20,000 worth of bark, shakes, pickets, shingles and fencing were consumed…[The fire's heat] was so intense that tall redwood and oak trees were in a moment stripped of their leaves and moss, searing the bark and charring the limbs to death…Our informant says it was the largest fire he has seen in those woods…Large amount of quail, rabbit, hare, deer and other wild game, were, no doubt, consumed in the flames, which sometimes rolled in waves and volume thirty feet high for miles in length."*(*Sentinel* 8/2/1873)

As fire suppression increased, fire frequency dropped but intensity seemed to rise. Five twentieth century wildfires left scars not only in the North Coast watersheds, but also on the memories of those who lived through them.

September 1904

The town of Santa Cruz recorded a high temperature of 98 degrees on September 6, 1904, and a fire started in a sawdust pit at a mill on Pescadero Creek, sweeping up onto Ben Lomond mountain with an extent that eyewitnesses could not even calculate. Louis Moretti's land near the summit of the mountain was swept by the flames, leaving behind charred buildings and dead livestock. The flames were driven down the canyons almost to the coast itself. *"At Laguna Creek the fire came down the canyon last night, ran over the picturesque camp grounds on the northerly side of the road, crossed the road at the point where the famous buckeye stood which has been a curiosity and a landmark ever since Americans came to the country and passed on through the grove in a channel."* In numerous locations along the North Coast the fire drove all the way to the ocean. By the third day the smoke was so dense over Santa Cruz that the sun was a "red ball of fire" as it shone through the haze. Finally, on September 10, the fog rolled in and helped dampen the flames, but not before the fire had raced over an area estimated at over twenty square miles. (*Surf* 9/7/1904-9/12/1904) The 1904 fire was unique because the fire came directly to the coastline in several places. Generally, North Coast fires were confined to the more heavily timbered canyons and higher ridges.

June 1917

Unusual because it occurred so early in the season, this fire began near a lumber mill on Gazos Creek and then spread south and eastward. Several days later, the fire had swept through the Waddell Creek watershed and ScottsCreek and was burning in the upper part of the San Vicente watershed. The fire burned for ten days before the fog once again came in to reduce the intensity. It was estimated that the fire burned a total of twenty square miles of timber and brush. A motion picture company that was in the San Vicente canyon took the opportunity to alter the

script and use the fire as a backdrop for filming new scenes for the movie (*Sentinel* 6/20/1917-6/30/1917).

September 1919

Long-time Waddell canyon resident Hulda Hoover McLean remembered a fire in September 1919 that burned through the headwaters of the Waddell canyon. According to a contemporary newspaper account, the front of the wildfire stretched a distance of sixteen miles (McLean 2000; *Sentinel*, 9/30/1919).

September 1936

Again, a period of high wind and low humidity drove a huge fire into the North Coast Mountains, threatening for a time the State Park at Big Basin. Men from local CCC camps, along with local residents and troops from Fort Ord, battled the flames for a week. At one point there were over one thousand men fighting the fire, but it was the return of the fog that did as much to suppress the fire as the firefighters. September 1936 was a particularly difficult fire season throughout California with losses eventually estimated into the millions of dollars (*Sentinel* 9/27/1936-9/30/1936; *Pajaronian* 9/26/1936-9/29/1936).

September 1948

Everyone living on the North Coast in 1948 remembers the 15,000-acre fire that burned across the canyons above Davenport that September. Though it was contained within three days, the conditions were such that it spread quickly, jumping from canyon to canyon in minutes. The fire destroyed piles of tanbark ready for shipment, standing timber, and erased many of the structures left from the San Vicente logging days and the Big Creek Power Company (see Section 1.2.6.6). The power company flumes were destroyed in the fire as were several of the remaining long trestles built by the lumber company in the early 1900s (*Sentinel* 9/2-9/9/1948).

Fire Ecology

Santa Cruz, San Benito and Monterey Counties have nearly the lowest number of lightning fires in the state: from 1893 to 1979, only 101 lightening storms were recorded (Greenlee, 1983). The redwood forests, here at the southernmost and driest part of their range, probably evolved in an environment characterized by infrequent but intense (hot, crowning) fires. Greenlee's (1983) thesis was that the mean fire interval (MFI) under natural conditions was on the range of 100 to 150 years in the southern redwood forests, and that the presence of humans for the last 10,000 years decreased the MFI to 25-50 years, up until the past few decades. For much of California, modern fire suppression has resulted in essentially abnormal conditions, with periodic fire denied its regenerative role in forest ecology. In contrast, fire suppression along the North Coast has re-created pre-human conditions, at least for redwoods, with longer fire intervals and more intense fire behavior. If the vegetation changes in Big Basin attributed to modern fire suppression can be extrapolated to the Coast Dairies Property, the result will be increased tree density and tree invasion of shrub (chaparral) areas.

3.1.7 SUMMARY OF VEGETATIVE CONDITIONS

While the Coast Dairies property supports a number of native vegetative communities many, if not all, have been impacted by the wide variety of uses the land has seen over the past 200 years. For example, the coastal terrace prairies, comprising a diversity of perennial bunchgrasses and wildflowers and historically covering much of the landscape, have been virtually eliminated by agriculture and grazing and replaced by low diversity non-native grasslands and crops. A reduction in fire frequency has resulted in shrub encroachment on grasslands, further reducing their extent. The human-altered fire cycle had changed the relative amount of shrub and tree canopy, reducing diversity in these vegetation types as well. The old growth redwood forest that once grew in the upper watersheds of the Property was clear-cut. The forest regenerated from old growth stumps, but is not yet mature enough to exhibit the old growth characteristics important to such species as the endangered marbled murrelet. Overall, past land uses have had a profound influence on the distribution, extent, and diversity of native vegetation on the Property.

Even though vegetative diversity has been reduced, the Property still supports a number of plant communities considered rare (see Table 3.1-1). Some are relatively intact, meaning that most, if not all, characteristic species are still present. Others, although still readily identifiable, are missing many of their typical components.

Non-native plant species pose the most serious current threat to native communities throughout the property. From iceplant (*Carpobrotus edulis*) in the beach and foredune communities, to Italian ryegrass on the coastal terraces, to French broom and pampas grass in the areas disturbed by mining and road building and maintenance in the upper watersheds, non-natives have established a foothold in every community. In an intact ecosystem, natural disturbance generates and maintains vegetative diversity by setting back the clock on plant succession. For example, a landslide can remove trees from a wooded slope, creating a gap in the tree canopy that can then be colonized by a different set of species than those that grow under the canopy, thus adding to the diversity found in that area. Many California natives are adapted to particular disturbance regimes. However, when invasive non-native species are present disturbance, whether natural or anthropogenic, tends to create new habitat for non-natives, since these species are highly competitive and particularly well adapted to take advantage of open ground. Thus, at this point in time, disturbance tends to further reduce native vegetative diversity on the Property by facilitating the spread of invasive non-native species. As discussed in Section 3.1.6, other factors contributing to vegetation degradation at Coast Dairies that need to be addressed include feral pigs, overgrazing, and fire regime.

3.1.8 BOTANICALLY SENSITIVE AREAS

The purpose of this section is to identify Coast Dairies Analysis Zones containing vegetation types that are unique, that are especially sensitive to further degradation, or that could benefit from specific management or restoration activities (see Table 3.1-3). These categories are not necessarily mutually exclusive.

Redwood forest occurs on the Coast Dairies Property in Analysis Zones YB-1, YB-2, SVW-1, and SVW-2. Although the distribution of redwood forest was once much more widespread, this vegetation type is presently essentially endemic to the coast ranges of central and northern California and is therefore rare on a global basis. Statewide there are fewer than 10-50,000 acres remaining. Although redwood forest is not rare on a regional basis and the Coast Dairies forest is comprised of second growth, it should be considered a unique resource. Another unique resource on the Property is the brackish marsh that occurs at the mouth of Laguna Creek in LAM-1 (see also Section 3.2.5).

The coastal prairie that once dominated the terraces and slopes has been extirpated from most of the Property. Purple needlegrass is a component of the coastal prairie and still occurs in Analysis Zones YBS-1 and MW-1, along with associated native herbaceous species such as Ithuriel's spear and common muilla, as well as non-native annual grasses and herbs. These grasslands are sensitive to further disturbance, such as overgrazing or road maintenance, which have the potential to give the non-native species in this community a competitive edge over many of the natives.

On the other hand, purple needlegrass itself can benefit from a certain amount of disturbance, and where soils are thin, is able to outcompete non-native annuals. Therefore, Property's purple needlegrass grasslands might be amenable to certain restoration activities, such as a grazing regime managed specifically for needlegrass or a combination of grazing and prescribed burns. Restoration of purple needlegrass or indeed, coastal prairie, might well be possible on any of the less disturbed upper terrace grasslands using the same techniques described above.

Riparian forests are among California's most productive ecosystems (see Section 3.2) and their extent has been dramatically reduced in historic times. All of the Property's riparian Zones (MSPZ-1 and 2, SVSPZ-1, LSPZ-1 and 2, YBSPZ-1, and LASPZ 1, 2, 3, and 4) should be considered sensitive to further degradation and there are many opportunities for restoration along Coast Dairies watercourses. Particularly vulnerable are the smaller headwaters drainages. Here cattle have had, in some cases, a devastating impact—resulting in vegetation removal and gullying (see Section 4.1.5).

TABLE 3.1-3
ANALYSIS ZONES WITH UNIQUE VEGETATIVE RESOURCES PRESENT

Analysis Zone	Vegetation Type
Molino Watershed	
MSPZ-1	Red alder riparian forest
MSPZ-2	Central coast arroyo willow riparian forest
MW-1	Purple needlegrass grassland
San Vicente Watershed	
SVSPZ-1	Red alder, central coast live oak, and central coast arroyo willow riparian forests
SVW-1 and 2	Redwood forest
Liddell Watershed	
LSPZ-1 and LSPZ-2	Red alder and central coast arroyo willow riparian forest
Yellow Bank Watershed	
YBSPZ-1	Red alder and central coast arroyo willow riparian forest
YBW-1 and 2	Redwood forest
YBS-1	Purple needlegrass grassland
Laguna Watershed	
LAM-1	Brackish marsh, unique
LASPZ-1, 2, 3, and 4	All riparian forest types

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3.2 TERRESTRIAL WILDLIFE RESOURCES

3.2.1 REGIONAL SETTING

The proximity of the coastal mountains has isolated the Santa Cruz County shore, and resulted in a high degree of endemism (i.e., species restricted to this area alone). The phenomenon has been noted by natural scientists for some time: one of the earliest animals to receive endangered species status was the highly localized Santa Cruz long-toed salamander (*Ambystoma macrodactylum croceum*), listed under the precursor to the Endangered Species Act in 1967; several of this area's insects have been listed in the past three years, and the U.S. Fish and Wildlife Service (USFWS) recently established critical habitat for three endemic plants (see Section 3.1).

Residential and agricultural development in the region has reduced open space, limiting large expanses of most of the natural communities. Smaller species such as reptiles, amphibians and invertebrates are often restricted to certain communities, but regional open space, with its diversity of communities, is an important consideration for animals whose home ranges encompass several habitats. The Coast Dairies Property can also be discussed as providing food and refuge for birds migrating along the Pacific Flyway and habitat for transient mammals, including travel corridors, denning areas and foraging grounds. Wildlife corridors are particularly important for larger predators such as bobcat (*Lynx rufus*) and mountain lion (*Felis concolor*), whose existence is more dependent on distribution of prey than habitat. Anecdotal evidence suggests that both of these species use the Property as part of larger hunting grounds[1]. Recent research (Beier, 1995) has indicated that mountain lion travel corridors need to average about 1,000 feet in width of natural vegetation. This requirement is increasingly difficult to meet in the California Central Coast region, except along the North Coast of Santa Cruz County.

Large blocks of single habitat types are important as well, and are an issue throughout California. Bender (1998) analyzed what is called the "patch size effect" on population decline and reviewed the results of 25 published studies that tested for a relationship between patch size and population density. He reached the same conclusion as earlier researchers, i.e., that for "interior" species – those needing large areas of relatively homogeneous habitat -- the decline in population size associated with habitat fragmentation *per se* will be greater than that predicted from pure habitat loss alone.

There are six state parks (California Department of Parks and Recreation [DPR]) in the region surrounding the Coast Dairies Property as well as the Bonny Doon Ecological Reserve, managed by the California Department of Fish and Game. Four of the state parks and the Reserve essentially surround the Coast Dairies Property; forming a constellation of conservation lands. The importance and the future of regional conservation open space, and Coast Dairies role in its preservation, is further discussed in Section 5.4.2.

[1] An observation of a mountain lion crossing Highway 1 about 10 miles north of the Property was reported to Planning Team staff in January, 2001.

3.2.2 METHODOLOGY AND OVERVIEW OF HABITATS

3.2.2.1 METHODOLOGY

General Considerations

A wide variety of sources will eventually be incorporated into the Coast Dairies Archives (see Section 2.3) but could not be included in this ECR, largely for reasons of sheer volume. For example, the Christmas Counts of birds conducted by the Santa Cruz Bird Club include a 15-mile diameter circle centered at Henry Cowell Redwoods State Park and extending to Davenport. Results are published by the National Audubon Society (*Field Notes* vol. 12-25, *American Birds* vol. 26-47, *Field Notes* vol. 48-51 and *American Birds* un-numbered vol. published 1998-2000) and are contained in the records of the Club.

The emphasis in this section is rather to be generally descriptive of the wildlife resource, and specific where:

- long-term management could encounter a regulatory constraint (e.g., species on the Property that are formally listed under the state and federal endangered species acts);
- habitats are so diverse, productive, or sensitive that they deserve protection as a management priority (e.g., beaches); and
- wildlife resources might be tallied in sufficient detail to use as indicators of long-term ecological stability in an adaptive management program (see ECR Introduction).

The "special status" species (see Section 3.2.3) selected for focused analysis were those most likely to constitute a management issue and also (serendipitously) present in each of three habitat aggregations: along the coast, the snowy plover (*Charadrius alexandrinus nivosus*); at lower elevation inland sites the California red-legged frog (*Rana aurora draytonii*) and in forested areas of the higher canyons, the marbeled murrelet (*Brachyramphus marmoratus*).

Peregrine falcon (*Falco peregrinus*) and other raptors are predators some ecologists consider indicative of general ecosystem health and stability. The peregrine's restoration in the wild has been a subject of international and local importance, and there are known active peregrine eyries (nest sites) approximately 13 miles from the Coast Dairies northern boundary. One is along south Waddell Creek in Big Basin State Park and the other is along Bear Creek north of Boulder Creek (Linthicum pers. comm., 2001).

Winter use by a variety of raptors of Coast Dairies is a widely noted phenomenon. Local birdwatchers, ornithologists and raptor enthusiasts have recognized that large numbers of raptors can be regularly seen during the winter months on the North Coast (Scoping Meeting Minutes, March 10, 2001). The Planning Team considered that it merited quantification, since raptor species richness (total number of species in an area) has shown a strong positive correlation with

size of open space preserves (Bosakowski and Smith, 1997) and a negative correlation with human disturbance (Fletcher et al., 1999).

Species-specific Surveys

California Red-legged Frog. Surveys for California red-legged frogs at Coast Dairies were geographically comprehensive in scope. They were conducted to identify presence of different life stages, and surveys at any one pond were suspended once breeding at that pond was established -- the results are not intended to reflect relative abundance. Diurnal surveys were conducted at Ponds 1-13 and 17-22 (see Figure 3.2-1) on May 17, 18 and 23, 2000 by walking the perimeter of each pond and searching for adult red-legged frogs. At each pond, data concerning pond characteristics, including size, depth and amount of emergent vegetation, were recorded. Aquatic sampling was carried out at all ponds on May 17 and June 26 using dip-nets, seines and minnow traps. Nocturnal surveys were conducted on June 26, 2000 at those ponds for which breeding status had not been established. Diurnal surveys for metamorphs were conducted on September 7 at those ponds at which red-legged frog breeding status had still not been established. Ponds 24-26, which had not previously been identified as being on Coast Dairies Property, were surveyed at night on March 20, 2001.

Data for those ponds on lands leased by RMC Pacific Materials (Ponds 14, 15, 16, 23 and 24) are taken from an annual report submitted to USFWS as required by a Habitat Conservation Plan (Biosearch Wildlife Surveys, 2001). Surveys included diurnal and nocturnal surveys in the winter, spring and fall as well as aquatic sampling in the spring and summer.

Snowy Plover. Planning Team personnel (Biosearch Wildlife Surveys) examined the nesting status of western snowy plovers at weekly intervals between late April and late May, 2000, and every two weeks in June, 2000. Surveys were conducted at Davenport Landing Beach, Davenport Beach, Bonny Doon Beach, Yellow Bank Creek Beach and Laguna Beach. Throughout the surveys, Point Reyes Bird Observatory (PRBO) personnel working at Laguna Creek and Scotts Creek were contacted to determine the timing and success of nesting efforts.

Marbled Murrelet. Between May and August, 2000 the Property was surveyed for potential marbled murrelet nesting habitat using habitat standards from Hamer and Nelson (1995). Aerial photos were reviewed to identify large stands of trees and the most extensive forested areas. On August 24, 2000 Bryan Mori, a wildlife biologist with extensive experience with the species, toured the site to visit the most promising areas. David Suddjian, record keeper for the Santa Cruz Breeding Bird Atlas project, was contacted for the nearest nesting records for the species.

Peregrine Falcon and General Raptor Surveys . The Planning Team surveyed selected areas of the Coast Dairies Property for nesting peregrine falcons on May 18, 22, 25 and 26, 2000. Team raptor specialist Jack Barclay was accompanied by Janet Linthicum and Brian Latta from the University of California at Santa Cruz Predatory Bird Research Group on May 18. Potential nesting sites on coastal cliffs and vertical-faced rock outcrops in the interior of the Property were identified from aerial photographs and topographic maps. All coastal cliffs on the Coast Dairies

Property were surveyed by walking along the coastal bluffs and scanning the cliff faces with binoculars from above for nest ledges. Interior cliffs were surveyed by scanning cliff faces, nearby prominent perches and the airspace within one-quarter mile for adult peregrines with binoculars and/or a spotting scope for 15 to 55 minutes. Surveys were conducted in late May, 2000 when nesting peregrines should be conspicuous at their nest sites. Based on local nesting phenology (Linthicum pers. comm., 2001) late May is the nestling phase of the reproductive cycle when defensive adults and approximately 4-week old nestlings should be present and conspicuously visible. Coastal cliffs or rock outcrops were surveyed in the following analysis zones:

LS-2, west side of Liddell Creek
YBW-1, cliff on west side of Yellow Bank Creek
YBW-2, cliff on north side of Yellow Bank Creek in YBW-2 on revised map
CTB-1, coastal cliffs in revised LCTB-1
LCTB-2
MCTB-1
MCTB-2.

For the general inventory of Coast Dairies raptor use, a biologist conducted weekly raptor point counts at six locations on the Property from December 5, 2000 to January 26, 2001. Count locations were selected that afforded a maximum unobstructed view of prominent perches and the surrounding airspace with minimum overlap between adjacent count locations. Three count stations were on paved roads (MP-4, MP-2, MP-4 PG&E Substation) while the remaining three (LCT-1, LP-3 and YBP-2) were on unpaved agricultural roads that afforded reasonably easy access when wet. All raptors visible from the count location during a 5-minute period were identified to species and tallied on a field data form. Counts were conducted while scanning with 10x40 binoculars in two 360-degree sweeps around the horizon. In addition, raptors seen within one-quarter mile of the count location when approaching or leaving were also counted if it was certain that they were not seen from the count location. Counts were conducted progressively during a session starting at the southernmost or northernmost count location and proceeding to the next nearest location. The start and end times of the count session, temperature, wind direction and velocity and percent cloud cover were recorded.

Analysis Zone Summaries

All the wildlife surveyors in the field, regardless of the intent of any individual species focus, completed a *Daily Wildlife Survey Summary Form*, which recorded incidental observations of any special status species or significant wildlife habitat elements (e.g., a snag with a cavity nest). Following the 2000 field season, these sheets were compiled, along with analysis zone photographs and interviews with local natural resource specialists (Bulger; Eyster; Suddjian; Westphal; Seymour; Miller; Morgan; Alley; Mori pers. comm., 2001) to perform what the Planning Team termed an *Analysis Zone Summary*.

The intent of the Summary was to rank the zones – in a qualitative way and based largely on professional judgement – for their value as wildlife habitat. Each analysis zone was evaluated for

both wildlife resource opportunities and constraints. Each zone was given a score of 1-3 for opportunities related to the zone's current wildlife resource values, with 1 meaning there were limited wildlife resource attributes and 3 meaning there were unique wildlife resources present. Constraints scores were related to future uses that may affect wildlife in the zone, with 1 meaning there were minimal limits on future uses and 3 meaning there are sensitive wildlife resources that could be affected by changes in use/management of the zone. The summary analysis included the following:

- a general description of the biotic and abiotic features present in each zone including habitat for 27 special-status wildlife species that could occur on the Coast Dairies property;
- key wildlife resources such as listed species habitat;
- problem areas and enhancement potential;
- an Opportunity Score and explanation; and
- a Constraints Score and explanation.

An Opportunity Score of 3 represented the highest wildlife value of the area based on the diversity of native habitat(s) present and/or productivity for wildlife. Any zone with listed species habitat present (e.g., California red-legged frog breeding pond or snowy plover nesting habitat) automatically received an Opportunity Score of 3. A Constraint Score of 3 was given to a zone if any change in disturbance (especially human use) could diminish the wildlife resources present. A score of 1 was given to a zone if there were little or no native habitats present (e.g., a zone containing a high proportion of area in agricultural production) where future uses were least likely to diminish wildlife resource values.

3.2.2.2 OVERVIEW OF HABITATS

Wildlife habitats are not as delineated as vegetation communities, which are characterized by certain plant species adapted to specific environmental conditions. Wildlife habitats consist of an area where an organism lives, composed of various vegetative communities creating different areas for different life cycle needs, such as foraging areas, nesting areas, and shelter from predators. The variety of healthy, stable vegetative communities present, providing abundance and variety of foraging areas, nesting areas and shelter, defines the quality of the wildlife habitat present. High quality wildlife habitat on the Coast Dairies Property is present in all of those areas not directly impacted by agriculture and structures -- and even these can be important to certain species, as noted below.

Although the habitat for birds and mammals on the Property has been strongly influenced by the history of resource use and extraction (see Section 1.0) intact habitats are present in all of the vegetative communities, especially the riparian areas. The following habitat descriptions are

categorized according to the California Department of Fish and Game Wildlife Habitat Relationships System (Zeiner et al., 1988; Mayer and Laudenslayer, 1988).

Under the 1972 Coastal Zone Conservation Act, the Coast Dairies Property ends at the mean high water line – hence the title of this section. However, actions taken under the Plan may impact oceanic resources, and for this reason a brief discussion is included below. From the coastal considerations, habitat descriptions proceed inland.

Marine, Beaches and Bluffs

Offshore. Gray whales (*Eschrichtius robustus*) were observed within 100 yards of the shore, which comes as no surprise to Davenport residents or the tourists who come to whale watch.[2] Planning team surveyors observed sea otters (*Enhydra lutris*) on multiple occasions. Sea otters are most common along rocky shores and are closely associated with the kelp bed ecosystem (USFWS, 1996).

Intertidal. There has been no documented inventory of the intertidal portion of this habitat on the Property but work at the Fitzgerald Marine Reserve near Half Moon Bay documented 164 species of invertebrates in this zone (Brady/LSA, 1999). The biological richness and vulnerability of these habitats is recognized closer to Coast Dairies, at Ano Nuevo Point and Island, dedicated in 1974 as an "Area of Special Biological Significance" under the State Water Quality Control Board. The habitat extent at Coast Dairies is limited, but both sensitive and valuable.

Beaches. Coast Dairies hosts significant numbers of wintering shorebirds (Gill et al., 1995), gulls, and wading birds, although there are probably more shorebirds that pass through the state as spring and fall migrants. Some shorebird species, such as black turnstones and black oystercatchers (the latter uncommon --Suddjian, 2000) winter only on the rocky portions of coastline. The importance of the beaches for snowy plover is discussed in Section 3.2.3.1.

Bluffs. Coastal bluffs are the seaward edges of marine terraces uplifted from the seabed (CCC, 1987). Composed mainly of sedimentary rocks such as sandstones and prone to erosion, caves, stacks, and arches form both inhospitable natural environments and a habitat for specialized nesting birds such as cliff swallows and black swift (*Cypseloides niger*).

Grasslands and Artificial Ponds

Grassland habitat attracts seed eaters as well as insect eaters. California quail (*Callipepla californica*), mourning dove (*Zenaida macroura*), and meadowlarks (*Sturnella neglecta*) are a few seed eaters that use grasslands for nesting. Insect eaters such as scrub jays (*Aphelocoma caerulescens*), barn swallows (*Hirundo rustica*), and northern mockingbirds (*Mimus polyglottus*) use the habitat for foraging only. Mammals such as California vole (*Microtus californicus*), deer

[2] Along the North Coast, the southbound migration is most evident in January but continues through February. The return migration passes the North Coast from late February through April.

mouse (*Peromyscus maniculatus*), broad-footed mole (*Scapanus latimanus*), and black-tailed jackrabbit (*Lepus californicus*) forage and nest within the grassland. Mule deer (*Odocoileus hemionus*) will use grasslands for grazing and for bedding at night. Small rodents attract raptors such as red-tailed hawks (*Buteo jamaicensis*) and red-shouldered hawks (*Buteo lineatus*). Southern alligator lizard (*Gerrhonotus multicarinatus*) and Pacific slender salamander (*Batrachoseps pacificus*) use the grasslands to forage for invertebrates found within and underneath fallen logs.

Within the Property grasslands are manmade ponds and fresh emergent wetlands that offers water, food and cover for a variety of species. Mammals are attracted to the water including meadow voles, raccoons (*Procyon lotor*), striped skunk (*Mephitis mephitis*), and gray fox (*Urocyon cinereoargenteus*). Reptiles and amphibians that use this habitat for feeding and breeding and were observed during red-legged frog surveys include common garter snake (*Thamnophis couchixxi*), western toad (*Bufo boreus*) and tree frog (*Hylla regilla*).

Coastal Marsh

Analysis Zone LAM-1 is the only natural expression of this habitat (there are artificial ponds along the coast), and important if only for its scarcity on the Property. It is largely a freshwater system with some tidal influence, as evidenced by the birds observed there, among them mallards and grebes. The pied-billed grebe (*Podilymbus podiceps*) forages in saltwater but, for the most part, inhabits freshwater ponds. The dominance of mallards (*Anas platyrhynchos*), a freshwater duck present in large numbers at LAM-1 and with young of the year (May, 2001) suggest this is used as a brood pond. Both cover and forage are plentiful.

Coastal Scrub

In some areas, Douglas fir trees (*Pseudotsuga menziesii*) and coast live oak invade this habitat, and it also contains scattered patches of grassland. The resulting overlap or "ecotone" contains species that are attracted to edges of two communities for foraging and nesting. Coastal scrub is less vegetatively productive than adjacent grassland or riparian habitats, but seems to support equivalent numbers of wildlife species (Mayer and Laudenslayer, 1988). Species commonly occurring in the coastal scrub include orange crowned warbler (*Vermivora celata*), bushtit (*Psaltriparus minimus*), and California horned lizard (*Phrynosoma coronatum*).

Riparian Forest

Riparian (streamside) areas provide nesting habitat and insect diversity attractive to a variety of migratory birds. Diverse foraging substrates, such as foliage, bark and ground substrates, increase feeding availability. The structure and composition of these areas is described above in Section 3.1.3. Riparian areas, due to their biological wealth and severe degradation, are vital habitat for the conservation of neotropical migrants and resident birds of the Western U.S. (RHJV, 2000). For this reason, and because detailed information has been gathered on riparian birds at Coast Dairies, the discussion below is more comprehensive than for other habitats on the

Property. Historically, there were a great many more species nesting in riparian habitats than at present, especially when the areas were wide enough to permit both a stable tree and brush canopy. Birds that forage for insects in the leaves of plants include Bewick's wren (*Thryomanes bewickii*), bushtit (*Psaltriparus minimus*), and black-headed grosbeak (*Pheuticus melanocephalus*). Bark-insect foraging species, such as downy woodpecker (*Picoides pubescens*) and white-breasted nuthatch (*Sitta carolinensis*) forage for insects in the bark. There are a few species that are adapted to foraging for insects in flight, such as western wood pewee (*Contopus sordidulus*) and tree swallows (*Tachicyneta bicolor*). Although insects are the primary food source for most species in the riparian habitat, ground dwelling species, such as California quail (*Callipepla californica*) and brown towhee (*Pipilo fuscus*), are also present in the riparian habitat, feeding primarily on seeds.

As with much of California, these areas at Coast Dairies suffered during the era of resource extraction (see Photo 1-7). Loss of riparian woodland habitat, which in many parts of the state may exceed 95 percent of pre-settlement range, is thought to be responsible for the decline in songbird populations on the West Coast (PRBO, 1994). Wilson's warbler (*Wilsonia pusilla*) has been documented as showing a 9.8 percent decline each year, from 1980 to 1992. Bewick's wren is of management concern in more than half of the nation's USFWS regions, due to documented or apparent population declines. The Swainson's thrush (*Catharus ustulatus*) is a proposed California Species of Special Concern (see Section 5.1.2) and the yellow warbler (*Dendroica petechia*) has already received this designation. Both of these species are declining in California and have been extirpated from parts of their former breeding range. Warbling vireo (*Vireo gilvus*) also show a decline in California.

Table 3.2-1 lists neotropical migrant species of management concern for the USFWS Pacific Coast Region, which includes the California Central Coast region, that were detected during surveys conducted along the Central Coast in 1999 as part of the Central Coast Riparian Bird Conservation Project[3] (CCRBCP). The right-hand column lists riparian associated species of conservation priority from the Riparian Bird Conservation Plan (RHJV, 2000) that were detected. Taken as a whole, the species are those for which long term viability has been identified as a concern and which are present in Central Coast riparian areas which have been sampled for the Project. The Planning Team considered these an informal standard against which to assess bird diversity at Coast Dairies.

By this standard, at least one analysis zone (SVSPZ-1) does very well, suggesting that it is a significant Property resource: along San Vicente Creek, four of the five most abundant species during the CCRBCP were those listed on Table 3.2-1: song sparrow, Wilson's warbler, Bewick's wren, and Pacific-slope flycatcher (*Empidonax difficilis*) (Scoggin pers.comm., 2001).

[3] This project was initiated by the Point Reyes Bird Observatory (PRBO) and the Coastal Watershed Council (CWC).

TABLE 3.2-1
SPECIES DETECTED IN RIPARIAN HABITAT DURING CENTRAL COAST POINT COUNT SURVEYS THAT HAVE DESIGNATED CONSERVATION STATUS.

Species of Management Concern	Species of Conservation Priority in Riparian Habitat
Allen's Hummingbird	Warbling Vireo
Olive-sided Flycatcher	Swainson's Thrush
Pacific-slope Flycatcher	Yellow Warbler
Bewick's Wren	Common Yellowthroat
Lawrence's Goldfinch	Wilson's Warbler
California Thrasher	Yellow-breasted Chat
Song Sparrow	
Black-headed Grosbeak	

Source: Office of Migratory Bird Management of the USFWS, 1995.

Woodland and Forest Series

The tree-dominated habitats at Coast Dairies are amalgams of several habitats as described by Mayer and Laudenslayer (1988), including *Redwood* and *Hardwood-Conifer*. As described in Section 3.1, mixed evergreens are found on moist, well-drained slopes with coarse soils (Monterey Cypress, Monterey pine, and knobcone pine); redwood occurs primarily on the north-facing slopes of canyon drainages where it can be the sole or dominant tree.

This habitat is a usually fairly dense woodland, but since it is relatively young, snags and downed woody material are generally sparse throughout. Mixed evergreen forests contain food for species such as chestnut-backed chickadee (*Parus rufescens*), Steller's jay (*Cyanocitta stelleri*), and pygmy nuthatch (*Sitta pygmaea*). These species are bark gleaners and aerial feeders, catching insects in flight. Allen's hummingbirds (*Selasphorus sasin*) use vines growing around trees for nectar and for insects that are attracted to the nectar. Other species, such as the great horned owl (*Bubo virginianus*) and Cooper's hawk (*Accipter cooperi*), use the tall trees for roosting and foraging perches during the day. The western gray squirrel (*Sciurus griseus*) and gray fox (*Urocyon cinereoargenteus*) both feed on mushrooms, fruits, and nuts within the woodlands. A variety of bat species are known to occur in this habitat and include pallid bats (*Antrozous pallidus*), long-eared myotis (*Myotis evotis*), and fringed myotis (*Myotis thysanoides*).

3.2.3 SPECIAL STATUS SPECIES

As discussed below, several species known to occur on or in the vicinity of the Property are accorded "special status" because of their recognized rarity or vulnerability to various causes of habitat loss or population decline. Some of these receive specific protection defined in federal or State endangered species legislation (see Section 6.1). Others have been designated as "sensitive" on the basis of adopted policies and expertise of State resource agencies or organizations with acknowledged expertise, or policies adopted by local governmental agencies such as counties, cities, and special districts to meet local conservation objectives. These species are referred to collectively as "special status species" in this ECR, following a convention that has developed in practice but has no official sanction.

A list (Table 3.2-2) of special status animal species reported to occur within the vicinity[4] of the Property was compiled on the basis of data in the California Natural Diversity Data Base (CNDDB) (2000), review of biological literature of the region and consultation with local experts (see Section 3.2.7.2). The list is intended to be comprehensive and will be used as the basis for identifying impacts and mitigation during the environmental analysis phase of Plan development. At that time, special status animal species that typically occur within habitats present on the Property but were not specifically identified during surveys will be presumed present on the site.

[4] Defined as the North Coast from Ano Nuevo to Santa Cruz and inland to an elevation of 1000 feet

TABLE 3.2-2
SPECIAL STATUS ANIMAL SPECIES REPORTED TO OCCUR WITHIN THE VICINITY OF THE COAST DAIRIES PROPERTY

Common Name	Listing Status (USFWS/CDFG)	General Habitat	Site Occurrence
		FEDERAL OR STATE LISTED SPECIES	
INVERTEBRATES			
Longhorn fairy shrimp *Branchinecta longiantena*	FE / -	Vernal Pools	
Vernal Pool fairy shrimp *Branchinecta lynchi*	FT / -	Vernal Pools	
Ohlone tiger beetle *Cicindela ohlone*	PE / -		
Smith's blue butterfly *Euphilotes enoptes smithi*	FE / -		
Vernal pool tadpole shrimp *Lepidurus packardi*	FE / -	Vernal Pools	
Mt. Herman June beetle *Polyphylla barbata*	FE / -		
Zayante band-winged grasshopper *Trimerotropis infantilis*	FE / -		
Callippe silverspot butterfly *Speyeria callippe callippe*	FE / -	Grasslands supporting host plants *Viola pedunculata*	
AMPHIBIANS			
Santa Cruz long-toed salamander *Ambystoma macrodactylum croceum*	FE / CE	Temporary ponds and vegetated drainages	
California red-legged frog *Rana aurora draytonii*	FT / CSC	Lowlands or foothills in or near sources of water with shrubby or emergent riparian vegetation	**Present On-Site** California red-legged frog has been located in ponds and streams on-site
REPTILES			
San Francisco garter snake *Thamnophis sirtalis tetraenia*	FE / -		

TABLE 3.2-2 (Continued)
SPECIAL STATUS ANIMAL SPECIES REPORTED TO OCCUR WITHIN THE VICINITY OF THE COAST DAIRIES PROPERTY

Common Name	Listing Status (USFWS/CDFG)	General Habitat	Site Occurrence
Marbled murrelet *Brachyramphus marmoratus*	FT / -		
Aleutian Canada goose *Branta canadensis leucopareia*	FD / -	Breeds in marshes from the Arctic Slope to northeastern California	
Western snowy plover *Charadrius alexandrinus nivosus*	FT / CSC (nesting)	Sandy beaches on marine and esturaine shores – requires sandy, gravelly or friable soils for nexting	**Present On-site** Nesting colonies of western snowy plover occur at the mouth of Scotts Creek and the mouth of Laguna Creek
Mountain plover *Charadrius montanus*	FPT / -	Grasslands	
(Little) willow flycatcher *Empidonax traillii brewsteri*	- / CT	Riparian habitats	
American peregrine falcon *Falco peregrineus americanus*	FD / CE, CFP, 3503.5	Nests on cliffs and tall buildings	
Bald eagle *Haliaeetus leucocephalus*	FT / 3503.5	Nests on cliffs and snags near large bodies of water	
California black rail *Laterallus jamaicensis coturniculus*	FSC / CT	Nests and forages in dense pickleweed	
Brown Pelican *Pelecanus occidentalis*	FE / CE	Nests in islands off the coast of California and forages in open bay and ocean waters	
California Clapper Rail *Rallus longirostris obsoletus*	FE / CE	Nests and forages in dense pickleweed	
Bank swallow *Riparia riparia*	- / CE	Cliffs with friable soils near water	
California least tern *Sterna antillarum browni*	FE / CE	Nests and forages in sandy beaches and coastal wetlands	
MAMMALS			
Southern sea otter *Enhydra lutris nereis*	FT / -		

TABLE 3.2-2 (Continued)
SPECIAL STATUS ANIMAL SPECIES REPORTED TO OCCUR WITHIN THE VICINITY OF THE COAST DAIRIES PROPERTY

Common Name	Listing Status (USFWS/CDFG)	General Habitat	Site Occurrence
FEDERALLY OR STATE PROPOSED OR CANDIDATE FOR LISTING SPECIES			
INVERTEBRATES			
Ohlone tiger beetle *Cincindela ohlone*	FPE/ -	Occurs in open spaces in native grasslands in the Santa Cruz area	
AMPHIBIANS			
California tiger salamander *Ambystoma californiense*	FC / CSC	Small mammal burrows and ponds	
FEDERAL OR STATE SPECIES OF CONCERN			
INVERTEBRATES			
Opler's longhorn moth *Adella oplerella*	FSC/ -	Feeds on *Platystemon californicus* associated with grassland	
Empire cave pseudoscorpion *Fissilicreagris imperialis*	FSC/ -	Known only from Empire Cave – a metamorphosed limestone cave subject to intermittent flooding	**Presumed Absent** Suitable habitat for this species does not occur on the Coast Dairies Property.
Bridges' Coast Range shoulderband snail *Helminoglypta nickliniana bridgesi*	FSC / -	Costal dune and scrub habitat	
California linderiella fairy shrimp *Linderiella occidentalis*	FSC / -	Vernal Pools	
Dolloff cave spider *Meta dolloff*	FSC/ -	Known from caves in the Santa Cruz area	**Presumed Absent** Suitable habitat for this species does not occur on the Coast Dairies Property.
San Francisco lacewing *Nothochrysa californica*	FSC/ -	Woodlands and coastal scrub habitat	
Unsilvered fritillary *Speyeria adiasta adiaste*	FSC/ -	Feeds on *Viola pedunculata*, associated with grasslands	
Mackenzie's cave amphipod *Stygrobromus mackensiei*	FSC/ -	Known only from Empire Cave – a metamorphosed limestone cave subject to intermittent flooding	**Presumed Absent** Suitable habitat for this species does not occur on the Coast Dairies Property.

TABLE 3.2-2 (Continued)
SPECIAL STATUS ANIMAL SPECIES REPORTED TO OCCUR WITHIN THE VICINITY OF THE COAST DAIRIES PROPERTY

Common Name	Listing Status (USFWS/CDFG)	General Habitat	Site Occurrence
AMPHIBIANS			
Foothill yellow-legged frog *Rana boylei*	FSC / CSC	Freshwater ponds and streams	
Western spadefoot toad *Scaphiopus hammondii*	FSC / CSC	Freshwater ponds and streams	
REPTILES			
Silvery legless lizard *Anniella pulchra pulchra*	FSC / CSC	Upland scrub and chaparral	
Northwestern pond turtle *Clemmys marmorata marmorata*	FSC / CSC	Slow moving streams with open areas for basking	The nearest reported occurrence of this species is from Moore Creek.
California horned lizard *Phrynosoma coronatum frontale*	FSC / CSC	Friable soils in shrub habitat	
BIRDS			
Cooper's hawk *Accipiter cooperi*	- / CSC, 3503.5	Nests in dense forests, oak woodlands, riparian habitats	
Sharp-shinned hawk *Accipiter striatus*	- / CSC, 3503.5	Nests in dense forests, oak woodlands, riparian habitats	
Tricolor blackbird *Agelaius tricolor*	FSC / CSC	Nests in cattails and dense vegetation near water	**Present On-Site** This species is known to occur at Scotts Creek Marsh
Grasshopper sparrow *Ammodramus savannarum*	FSC / -	Grasslands	
Bell's sage sparrow *Amphispiza belii belii*	FSC / -	Scrub and chaparral	
Great blue heron *Ardea herodia*	- / CSC (nesting)	Colonial nesting in large trees.	
Western burrowing owl *Athene cunicularia*	FSC / CSC, 3503.5	Nests in burrows of small mammals in grasslands	The nearest reported occurrences are located on property owned by the University of California Santa Cruz

TABLE 3.2-2 (Continued)
SPECIAL STATUS ANIMAL SPECIES REPORTED TO OCCUR WITHIN THE VICINITY OF THE COAST DAIRIES PROPERTY

Common Name	Listing Status (USFWS/CDFG)	General Habitat	Site Occurrence
Short-eared owl *Asio flammeus*	FSC / CSC	Nests in open grassland	
American bittern *Botarus lentiginosus*	FSC / -	Breeds in marshes	
Ferruginous hawk *Buteo regalis*	FSC / -	Woodlands	
Golden eagle *Aquila chrysaetos*	CSC, CFP, 3503.5/-	Open areas with associated cliffs or trees for nesting	
Costa's hummingbird *Calypte costae*	FSC / -	Scrub	
Lawrence's goldfinch *Carduelis lawtencei*	FSC / -	Forests, woodlands or scrub	
Vaux's swift *Chaetura vauxi*	FSC / -	Nests in cavities of snags.	
Lark sparrow *Chondestes grammacus*	FSC / -	Brush and trees	
Northern harrier *Circus cyaneus*	- / CSC (nesting), 3503.5	Nests in scrubby vegetation on edges of marshes	
Olive sided flycatcher *Contopus cooperi*	FSC / -	Forests and woodlands	
Black swift *Cypseloides niger*	- / CSC (nesting)	Breeds on cliffs behind or adjacent to waterfalls in deep canyons and bluffs	**Present On-Site** This species is known to nest at Coast Dairies.
Hermit warbler *Dendroica occidentalis*	FSC / -	Conifer forests	
California warbler *Dendroica petechia brewsteri*	- / CSC	Nests in riparian woodlands	
White-tailed kite *Elanus leucurus*	FSC / CFP, 3503.5	Nests in dense topped trees in vicinity of marshes and grasslands	
Pacific slope flycatcher *Epidonax difficilis*	FSC / -	Moist woods and forests	
California horned lark *Eremophila alpestris actia*	FSC / CSC	Breeds and winters in open grasslands and pastures	
Merlin *Falco columbarius*	- / CSC	Nests in oak savannah	
Common loon *Gavia immer*	FSC / -	Grassy edges near freshwater	

TABLE 3.2-2 (Continued)
SPECIAL STATUS ANIMAL SPECIES REPORTED TO OCCUR WITHIN THE VICINITY OF THE COAST DAIRIES PROPERTY

Common Name	Listing Status (USFWS/CDFG)	General Habitat	Site Occurrence
Saltmarsh common yellowthroat *Geothlypis trichas sinuosa*	FSC / CSC	Requires thick, continuous cover down to the water surface for foraging and tall grasses, emergent vegetation or willows for nesting	**Present On-Site** This species is known to occur at Scotts Creek Marsh
California gull *Larus californicus*	- / CSC	Nests on ground near bays and inland rivers east of the Sierra Nevada and Cascades	
Loggerhead shrike *Lanius ludovicianus*	FSC / CSC	Nests in open fields and woodlands	
Lewis' woodpecker *Melanerpes lewis*	FSC / -	Woodlands	
Alameda song sparrow *Melospiza melodia pusillula*	FSC / CSC	Nests on ground near freshwater	
Long-billed curlew *Numenius americanus*	FSC / CSC	Nests near water in prairies and grassy meadows	
Osprey *Pandion haliaetus*	- / CSC, 3503.5	Nests on tall snags and hunts over open water	
American white pelican *Pelecanus erythrorhynchos*	- / CSC	Nests on ground near bays and inland rivers in the Klamath Basin	
White faced ibis *Plegadis chihi*	FSC / -	Freshwater marshes	
Black skimmer *Rynchops niger*	- / CSC	Nests in coastal beaches or sandbars	
Rufous hummingbird *Selasphorus rufus*	FSC / -	Forest edges and meadows	
Allen's hummingbird *Selasphorus sasin*	FSC / -	Wooded or brushy areas	
Red-breasted sapsucker *Sphyrapicus ruber*	FSC / -	Woodlands	
Elegant tern *Sterna elegans*	FSC / CSC	Nests on salt marsh dikes and sand beaches in Mexico and extreame southern California	
Bewick's wren *Thryomanes bewickii*	FSC / -	Chaparral and pinyon woodlands	
California thrasher *Toxostoma redivivum*	FSC / -	Chaparral	
MAMMALS			
Pallid bat *Antrozous pallidus*	- / CSC	Caves, crevices, mines, open buildings	

TABLE 3.2-2 (Continued)
SPECIAL STATUS ANIMAL SPECIES REPORTED TO OCCUR WITHIN THE VICINITY OF THE COAST DAIRIES PROPERTY

Common Name	Listing Status (USFWS/CDFG)	General Habitat	Site Occurrence
Pacific western (Townsend's) big-eared bat *Corynothinus townsendii townsendii*	FSC / -	Buildings, caves, and cliffs	
Western mastiff bat *Eumops perotis californicus*	FSC / -	Crevices on cliff faces, high buildings, trees, and tunnels	
Long-eared myotis *Myotis evotis*	FSC / -	Crevices, under bark, snags, forests	
Small-footed myotis *Myotis leibii*	FSC / -	Caves, and crevices, sometimes bridges and bark	
Fringed myotis *Myotis thysanodes*	FSC / -	Caves, crevices, montane forest	
Long-legged myotis bat *Myotis volans*	FSC / -	Buildings, caves, and cliffs	
Yuma myotis bat *Myotis yumanensis*	FSC / -	Buildings, caves, and cliffs	
	OTHER SPECIES OF SPECIAL STATUS		
INVERTEBRATES			
Monarch butterfly *Danaus plexipus*	/ *	Groves of eucalyptus and native trees along the coast	**Present On-Site** This species is known to occur within Monterey cypress and eucalyptus along Cement Road and near the intersection of Ocean and Marine View within the town of Davenport.
BIRDS			
Red-tailed hawk *Buteo jamaicensis*	- / 3503.5	Nests in large trees.	
American kestrel *Falco sparverius*	- / 3503.5	Nests in cavities of snags.	
Black-crowned night heron *Nycticorax nycticorax*	MB / -	Breeds in marshes	
MAMMALS			
Harbor seal *Phoca vitulina*	MPA /CFP	Open water and gently sloping gravel areas for resting	**Present on Site** found along coastline

TABLE 3.2-2 (Continued)
SPECIAL STATUS ANIMAL SPECIES REPORTED TO OCCUR WITHIN THE VICINITY OF THE COAST DAIRIES PROPERTY

STATUS CODES:

FEDERAL: (U.S. Fish and Wildlife Service)

FE = Listed as Endangered by the Federal Government
FT = Listed as Threatened by the Federal Government
FPE = Proposed as Endangered by the Federal Government
FD = Formerly listed as Endangered or Threatened by the Federal Government, now removed from that list "de-listed"
FC = Candidate for Federal listing
FSC = Federal Species of Concern
MB = Migratory Bird Treaty Act
MPA = Marine Mammal Protection Act

STATE: (California Department of Fish and Game)

CE = Listed as Endangered by the State of California
CT = Listed as Threatened by the State of California
CFP = Fully protected species under the Fish and Game Code of California
CR = Listed as Rare by the State of California
CSC = California species of special concern
* = Special Animals
3503.5 = no harm to raptor nests or eggs

Obviously, much could be and has been written about any of these species. In the subsections below, descriptions for known resident animals concentrate on legal status (degree of endangerment), a brief physical description and those aspects of natural history or habitat which are most vulnerable to the impact of management decisions.

The marbled murrelet was eliminated from further consideration, at least as an ECR issue, following habitat suitability surveys conducted in 2000. It was concluded that the Coast Dairies property does not currently support suitable nesting habitat for the species. The entire property was clear-cut in the early 1900's, and there are no old-growth trees remaining. The woodland habitats that have re-grown do not contain large trees or groves with appropriate structure to allow for nesting by the species. Many of the forested habitats, particularly in the northern part of the site, are present only in small patches, which are not suitable for nesting by murrelets. In the Laguna and Liddell watersheds, there are extensive forests, but the trees are not large enough to provide the appropriate microhabitat for nesting sites. The closest confirmed nesting site for marbled murrelets is at Big Basin Redwoods State Park (Mori, Suddjian pers. comm., 2000). A radiotelemetry study was performed by CDFG along the Santa Cruz and San Mateo coasts in 2000. Results of this survey (currently unavailable) may indicate that the species flies over the Property to nesting sites further inland.

3.2.3.1 SNOWY PLOVER

Species Status, Description and Habitat Requirements

The snowy plover (*Charadrius alexandrinus nivosus*) was listed as Threatened in 1993, primarily because of poor reproductive success resulting from human disturbance and predation, combined with permanent or long-term loss of nesting habitat to urban development. It is a bird adapted to ground-nesting on sandy beaches, where the survival value of seeing predators coming can exceed the value of adequate cover to hide behind. Plovers are slightly over six inches long, and pale colored. Upperparts are the color of dry sand on California beaches; the underparts are white. There are dark marks on the forecrown, auriculars (ear coverts), and at the shoulder. Plovers have a short black bill.

The Pacific coast population of the western snowy plover, of which the Coast Dairies birds are a part, breeds primarily from southern San Francisco Bay to southern Baja California, in 157 identified current or historical locations on --5 in Washington, 19 in Oregon, and 133 in California (Federal Register: December **7**, 1999 [Volume 64, Number 234]). Snowy plovers are very local and erratic in occurrence inland (i.e., away from the coast) in northern California (McGill et al., 1995), and their preferred waterfront nesting habitat is sand spits, dune-backed beaches, beaches at creek and river mouths, and salt pans at lagoons and estuaries. Important components of the beach/dune/estuarine ecosystem include surf-cast kelp, sparsely vegetated foredunes (beach area immediately in front of a sand dune), interdunal flats (flat land between dunes), spits, washover areas, blowouts (a hole or cut in a dune caused by storm action), intertidal flats (flat land between low and high tides), salt flats, flat rocky outcrops, and gravel bars.

The parts of the beaches selected for nesting are generally open; however, areas surrounding plover nests can have up to 25 percent total cover. The majority of snowy plovers are site-faithful, returning to the same breeding site in subsequent breeding seasons. Three-quarters of the birds breeding in Monterey and Santa Cruz Counties in 2000 had been there the year before (Page et al., 2001).

The breeding/nesting season for western snowy plovers (courtship, copulation, nest scraping, egg laying, incubation, and rearing of the young to the fledgling) extends from early March to late September. Wintering habitat is also important, especially since birds breeding in interior areas of the Great Basin may spend the winters with coastal populations, and loss of wintering habitat has certainly contributed to the decline of the species. Wintering plovers are found on many of the beaches used for nesting but also on beaches not used for nesting. The wintering season generally extends from October to February but often overlaps the nesting season with birds arriving on wintering areas as early as midsummer.

Occurrence on the Coast Dairies Property

Shortly after the Property came under the interim management of the Trust for Public Land, the Pacific Coast population of the western snowy plover received the additional protection of a

Critical Habitat designation (Federal Register: December 7, 1999 [Volume 64, Number 234]). Critical Habitat is defined by the Endangered Species Act as "essential to the conservation of the species," and imposes extensive responsibilities on any federal agency (e.g., the Bureau of Land Management [BLM]) whose policies might impact it. Two areas on or adjacent to Coast Dairies were identified: Scotts Creek Beach, northwest from the 60 foot contour line of the south end (straddling the Property boundary), and Laguna Creek Beach, essentially the entirety of the beach below the 20 foot contour (Santa Cruz USGS 7.5 minute Quad 1981).

Three beaches in northern Santa Cruz County support nesting plovers and are regularly (since 1988) monitored by PRBO, including those on the Coast Dairies Property.[5] Scotts Creek and Laguna Creek beach nesting sites are protected only by what PRBO terms "symbolic fencing," i.e., a single rope and warning signs. In spring 2000, PRBO staff recorded a fledging success of 8 percent at Laguna Creek (Analysis Zone LAB-1) and 24 percent at Scotts Creek (Analysis Zone MB-1). The number of young birds leaving the nest is a clear measurement of how well any area is doing. It can be difficult to establish causes for low number, and the number for the Coast Dairies Beaches, especially Laguna Creek Beach, were low compared to an average fledging rate for all of Monterey and Santa Cruz Counties of 39 percent and 70 percent on a closed beach, Wilder Creek (see Table 3.2-3). Nests fail for a wide variety of reasons including natural predation and the physical effects of wind, but disturbance is a factor on these beaches.

TABLE 3.2-3
NEST SUCCESS OF SNOWY PLOVERS ON NORTH SANTA CRUZ COUNTY BEACHES IN 2000.

Beach	Adults	Nests	% Nests Hatching	Chicks	Juveniles	% Chicks Fledging	Juveniles per nest	Juveniles per male
Wilder Creek	12	7	57.1	10	7	70.0	1.00	1.17
Laguna Creek	10	7	71.4	13	1	7.7	0.14	0.25
Scotts Creek	14	11	90.9	29	7	24.1	0.64	1.00

Source: Carlton Eyster, PRBO.

[5] The Coast Dairies Planning Team surveyed all the beaches on Coast Dairies Property several times in April and May of 2000 to determine if nesting occurred in any area not under study by PRBO. No plovers were observed except at Scotts and Laguna Creek Beaches

3.2.3.2 CALIFORNIA RED-LEGGED FROG

The California red-legged frog is chiefly a pond frog that can be found in quiet permanent waters of ponds, pools, streams, springs, marshes, and lakes. Moist woodlands, forest clearings, and grasslands also provide suitable habitat for this species in the non-breeding season (Stebbins, 1985). Adult frogs seek waters with dense vegetation, such as cattails, along the shore that provide good cover (Miller et al., 1996), but may be found in unvegetated waters as well.

Frogs breed from January to May. Eggs are attached to vegetation in shallow water and are deposited in irregular clusters (Miller et al., 1996). Tadpoles grow to three inches before metamorphosing. Red-legged frogs are active year-long along the coast but will aestivate from late summer to early winter inland. Adults consume insects such as beetles, caterpillars and isopods, while tadpoles forage on algae and detritus.

They are found on the western slope of the Cascade-Sierran mountain system, in the North and South Coast Ranges, and the Transverse Range (Stebbins, 1985). Historically, red-legged frogs were found in the Central Valley and southern Sierra foothills, but habitat disturbance and the introduction of bullfrogs seem to have resulted in the extirpation of this species from these areas (Stebbins, 1985; Miller et al., 1996).

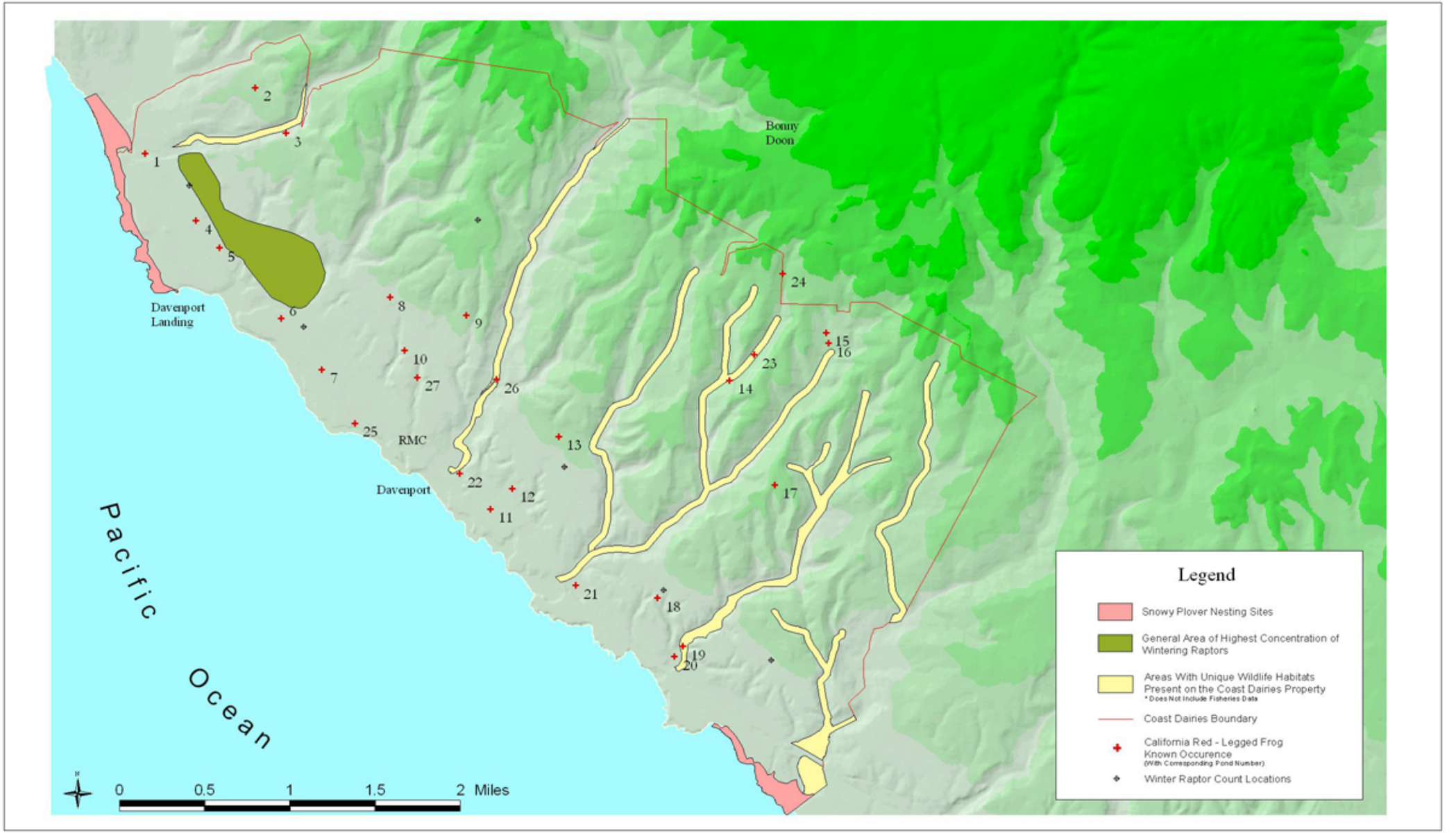
Occurrence on the Coast Dairies Property

Adult and/or sub-adult red-legged frogs were observed at 20 ponds on Coast Dairies Property (Table 3.2-4; Figure 3.2-1). Six of theses ponds (3, 4, 5, 9, 13 and 21) are agricultural ponds that are dependent upon water diversions to fill. Seven of the ponds (1, 8, 19, 20, 22, 26 and 27) are impoundments or diversions within creek channels, and fill naturally. One of the ponds (2) is an impounded spring and one of the ponds (10) is a seasonal wetland that forms near the Davenport cement plant. Three ponds (15, 16 and 23) are sediment basins at the Bonny Doon limestone quarry and are actively maintained as part of a Habitat Management Plan. One of the sites (Pond 24) is a sediment basin at the limestone quarry that is being managed for red-legged frogs as part of the HCP. One of the sites (Pond 14) is a wetland mitigation area constructed by RMC Pacific Materials near the quarry.

Breeding by red-legged frogs was documented at twelve ponds either by the presence of tadpoles (Ponds 2, 3, 5, 8-10, 14, 19, 21 and 24) or by the presence of calling adults (Pond 27). Surveyors (Biosearch Wildlife Surveys) suspected that breeding was successful at most of these ponds, although Pond 3 dried early in the season, and water diversions to Pond 23 were unreliable.

TABLE 3.2-4. RESULTS OF CALIFORNIA RED-LEGGED FROG SURVEYS AT PONDS ON COAST DAIRIES PROPERTY, MAY 2000 – FEBRUARY 2001

Pond #	Analysis Zone	UTM-N	UTM-E	CA Red-Legged Frog Adults	CA Red-Legged Frog Larvae	Pacific Treefrog	Western Toad	California Newt	Rough-skin Newt	SC Garter Snake
1	MSPZ-2	4099200	568925	X				X		
2	MP-1	4099850	569950	X	X	X	X	X		
3	MP-2	4099425	570250	X	X	X		X		
4	MCT-2	4098575	569425	X		X				X
5	MCTB-1	4098325	569650	X	X	X	X			X
6	MCTB-2	4097645	570250							
7	MCTB-2	4097200	570650							
8	MCT-4	4097900	571275	X	X			X		
9	SVP-1	4097750	572000		X	X				
10	MCT-4	4097400	571425	X	X	X				X
11	LCTB-1	4095925	572275							
12	LCT-1	4096125	572475			X				
13	LP-1	4096625	572900	X		X		X		
14	LSPZ-2	4097200	574500	X	X	X			X	
15	LW-3	4097675	575400	X		X			X	X
16	LW-3	4097575	575425	X		X			X	
17	YBS-1	4096225	574950			X				
18	YBP-1	4095125	573875			X	X			
19	YBSPZ-1	4094675	574125	X	X	X	X			X
20	YBCT-1	4094575	574050	X						X
21	LCT-2	4095225	573100	X	X		X			
22	SVS-1	4096250	571975	X		X				X
23	LSPZ-2	4097450	574725	X	X	X			X	
24	LW-2	4098225	574975	X	X	X			X	X
25	MCTB-2	4096700	570975			X				
26	SVSPZ-1	4097150	572300	X						
27	SVCT-2	4097150	571550	X		X				



SOURCE: Environmental Science Associates, Pacific Meridian Resources

Coast Dairies / 200071

Figure 3.2-1

Special-Status Wildlife Locations on the Coast Dairies Property

Of the seven ponds at which red-legged frogs were not observed, four (6, 7, 11 and 12) are cement-lined agricultural ponds that are drained periodically, two (17 and 18) are stock ponds that dry by the end of spring, and one (25) is very difficult to access, which influenced the effectiveness of surveys.

In summary, the California red-legged frog is widely distributed on the Coast Dairies Property, particularly in the lower elevation management zones. Sites at which breeding was documented are found in all watersheds except Laguna Creek. Although not surveyed as part of this effort, all named creeks and many of their tributaries provide non-breeding habitat. During the summer and fall, red-legged frogs are known to seek refuge in pools in coastal streams (Bulger 1999; USFWS 2001). California red-legged frogs have been documented[6] in San Vicente Creek (SVSPZ-1; McGinnis, 1990), in the West and Middle Forks of Liddell Creek (LSPZ-1 and LSPZ-2; Laabs, pers. obs.), in Yellow Bank Creek (YBSPZ-1; Alley, pers. comm.) and in Laguna Creek (LASPZ-3; Morgan, pers. comm.). Given the distribution of breeding and non-breeding habitats throughout the Coast diaries Property, the species could be found seasonally in most management zones during breeding migrations in the winter and spring. Activity during the summer is expected to center around aquatic habitats and those uplands within 300 feet.

It is important to note that no bullfrogs were observed on the Coast Dairies site. This non-native species has been implicated in the decline of the red-legged frog throughout much of its range. There are known populations of bullfrogs to the north at Año Nuevo State Reserve and to the south at Natural Bridges Beach State Park. Physical removal of adult bullfrogs has proven effective at reducing bullfrog populations and increasing red-legged frog populations (Stracken, Westphal pers. comm., 2000).

3.2.3.3 PEREGRINE FALCONS AND OTHER RAPTORS

Peregrines. No evidence of nesting peregrines was observed on the Coast Dairies Property during surveys in May, 2000. Cliffs containing the most suitable nest ledges in the interior of the Coast Dairies property are located along the upper reaches of Yellow Bank Creek in Analysis Zone YBW-1 and YBW-2.

Coast Dairies contains approximately six miles of coastal cliffs that range from 40-80 feet in height. The erosive nature of the rock on these cliffs does not support an abundance of large ledges that peregrines typically use for nesting. However, peregrine nesting on Coast Dairies coastal cliffs should not be totally unexpected. The bluffs contain a small number of marginally suitable nest ledges, and peregrines occasionally use abandoned stick nests constructed by other birds such as red-tailed hawks, ravens and cormorants, all of which occur on the Coast Dairies coastal cliffs. There was an active raven nest with at least one nestling in MCTB-2 in May, 2000.

Peregrines were observed twice during the 2000 nest surveys. A molting adult peregrine was observed from Swanton Road on May 22, 2000 soaring over the coastal cliffs and sloping terrain

[6] Bern Smith (Landsmiths) has also observed the species in Molino and Ferrari Creeks.

east of Molino Creek in Analysis Zones MP-1, MP-4 and MCTB-1. This bird disappeared from view to the northeast over Analysis Zone MP-1. The second sighting was a sub-adult (one-year old bird) observed soaring over the coastal cliffs north of Bonny Doon beach in Analysis Zone LACTB-1 on May 25, 2000.

General Raptors. A total of 405 individual observations of 10 species of raptors (9 diurnal, 1 nocturnal) were observed during seven surveys from December 5, 2000 to January 26, 2001. Red-tailed hawks (*Buteo jamaicensis*) were by far the most numerous raptor with 313 counted. Red-tailed hawks were nearly 10 times more numerous that the next most abundant species -- American kestrel (*Falco sparverius*) , which totaled only 33. The average red-tailed hawk count was 45 individuals per session compared to 5 kestrels. The total number of raptors counted per session for all six stations increased steadily from an initial low of 42 on December 18, 2000 and doubled to a high of 84 during the last count on January 26, 2001. The combined average count was 58 raptors per survey session. Since their distribution was not uniform throughout the Property, the Planning Team designated the area with the densest concentration a "unique habitat association"(see Section 3.2.4). Special status raptors observed are discussed by species below.

Cooper's hawk (*Accipiter cooperi*)

Listing Status: *California:* Species of Special Concern, California Code 3503-3503.5
Federal: None

The Cooper's hawk is a small bird hunter, hunting on the edges of forests in broken forest and grassland habitats where passerines forage for seeds and insects. This species nests in heavily forested areas near a water source. Some research studies on nesting Cooper's hawks rarely show the nests more than a quarter of a mile away from water, whether it is a cattle tank, stream or seep (Snyder, 1975). Typical trees used by Cooper's hawks are cottonwoods, coast live oaks and black oaks (Call, 1978). This species also nests in second growth conifer stands or deciduous riparian areas.

Northern harrier (*Circus cyaneus*)

Listing Status: *California:* Species of Special Concern, California Code 3503-3503.5
Federal: None

This species nests and forages along wet meadows, sloughs, savannas or prairies and marshes, feeding on small mammals. The territory for this species is often a minimum of 10-20 acres foraging area. The species is known to nest in Analysis Zone LAM-1.

White-tailed kite (*Elanus leucurus*)

Listing Status: *California:* California Code 3503-3503.5
Federal: None

This species is a California resident, but shifts regionally within the state based upon food availability. Prior to 1895 this species was common to widespread in valley and lower foothill

territory, but is now rare in many sections of the state. This species forages in wetlands and open brushlands, usually near water and streams. Oak woodlands, valley oak or live oak, or trees along marsh edges are used for nesting sites. The nest made by this species is a frail platform of sticks, leaves, weed stalks, and similar materials located in trees or brush. A combination of habitats is essential, including open grasslands, meadows or marshes for foraging and isolated dense-topped trees for perching and nesting.

3.2.3.4 OTHER SPECIAL STATUS SPECIES LIKELY TO BE PRESENT

Table 3.2-2 comprised a list of special-status species with *any* potential to occur on the Coast Dairies Property. The table below (3.2-5) is more predictive (i.e., the Planning Team team considers them likely or has informal information, such as personal communications, that they do occur). It lists species by watershed and analysis zone. Other special status species known to occur on the Property include:

Rhinoceros auklet (*Cerorhinca monocerata*)

Listing Status: *California:* Species of Special Concern
Federal: None

This sooty-brown seabird dives for small fish and nests in coastal burrows where the soil is soft and friable from the Alaska Peninsula south along coast to central California. During the breeding season, a pale knob projects upward from the base of the upper mandible giving a rhinoceros-like appearance to its otherwise more narrow and shallower bill. This auklet probably winters in inshore and offshore waters from breeding colonies south to southern California. (Terres, 1991). The bird is a confirmed nester in Analysis Zone MB-3.

Grasshopper sparrow (*Ammodramus savannarum*)

Listing Status: *California:* None
Federal: Fish and Wildlife Service: Migratory Nongame Bird of Management Concern

This sparrow is a true grassland bird – probably diagnostic for that habitat type – and the only grassland sparrow without streaks or markings on the breast. It nests in loose colonies on the ground. It eats most insects and earthworms, but also consumes grass and sedge seeds (Terres, 1991). It nests in several of the Property grasslands, including MP-1 and MP-4.

San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*)

Listing Status: *California:* Species of Special Concern
Federal: Species of Concern

This species prefers hardwood forests and brushlands and often forages above ground. Food includes berries, fungi, leaves, flowers, and nuts. (Jameson and Peeters, 1988). It is probably well distributed in shrub, woodland and riparian habitats at Coast Dairies.

TABLE 3.2-5
SPECIAL STATUS SPECIES LIKELY TO OCCUR IN THE MOLINO CREEK WATERSHED

Common Name *Scientific Name*	**State/ Fed. Status**	**MB-1**	**MB-2**	**MB-3**	**MCT-1**	**MCT-2**	**MCT-3**	**MCT-4**	**MCTB-1**	**MCTB-2**	**MP-1**	**MP-2**	**MP-3**	**MP-4**	**MS-1**	**MSPZ-1**	**MSPZ-2**	**MW-1**
California red-legged frog *Rana aurora draytonii*	CSC/ FT					B		B*	B*	B	B*	B*				B, NB	NB	
Peregrine falcon (nesting) *Falco peregrinus*	SE, CFP, 3503.5/ FD	F	F	F														
Western snowy plover Charadrius alexandrinus	CSC/ FT	N*																
Western pond turtle *Clemmys marmorata*	CSC/ -					A			A		A					A		
Double-crested cormorant (rookery) *Phalacrocorax auritus*	CSC/ -			N														
Cooper's hawk (nesting) *Accipiter cooperi*	CSC, 3503.5/ -						F	F	F*	F	N	F	F	F	N	N	N	N
Sharp-shinned hawk (nesting) *Accipiter striatus*	CSC, 3503.5/ -																	N
Golden eagle *Aquila chrysaetos*	CSC, CFP, 3503.5/ -								F	F	F	F	F	F	F			F
Ferruginous hawk (wintering) *Buteo regalis*	CSC/ FSC				W	W	W	W	W	W	W	W	W	W				
Northern harrier (nesting) *Circus cyaneus*	CSC, 3503.5/-				F	F*	F*	F	F	F	F	F	F	F*				
White-tailed kite (nesting) *Elanus leucurus*	CFP/ FSC				F	F	F*	F	F	F	N	N	N	N	N	N	N	N
Merlin (wintering) *Falco columbarius*	CSC/ -	W	W	W	W	W	W	W	W	W	W	W	W	W				
Long-eared owl (nesting) *Asio otus*	CSC/ -															N		
Rhinoceros auklet *Cerorhinca monocerata*	CSC/ -	N	N	N*														
Vaux's swift *Chaetura vauxi*	CSC/ FSC														N			N

TABLE 3.2-5 (Continued)
SPECIAL STATUS SPECIES LIKELY TO OCCUR IN THE MOLINO CREEK WATERSHED

Common Name ***Scientific Name***	**State/** **Fed. Status**	**MB-1**	**MB-2**	**MB-3**	**MCT-1**	**MCT-2**	**MCT-3**	**MCT-4**	**MCTB-1**	**MCTB-2**	**MP-1**	**MP-2**	**MP-3**	**MP-4**	**MS-1**	**MSPZ-1**	**MSPZ-2**	**MW-1**
Black swift *Cypseloides niger*	CSC/ FSC	N	N	N														
Olive-sided flycatcher *Contopus borealis*	-/ FSC										N				N			N
Loggerhead shrike *Lanius ludovicianus*	CSC/ FSC					N	N				N	N	N	N	N			N
California horned lark *Eremophila alpestris actia*	CSC/ -										N	N	N	N				
Yellow warbler *Dendroica petechia brewsteri*	CSC/ FSC												N			N	N	
Saltmarsh common yellowthroat *Geothlypis trichas sinuosa*	CSC/ -																	
Grasshopper sparrow (nesting) *Ammodramus savannarum*	-/ FSC				N			N			N*	N	N	N*				
Tricolored blackbird (nesting) *Agelaius tricolor*	CSC/ FSC					N					N							
Pallid bat *Antrozous pallidus*	CSC/ -														R	R	R	R
Townsend's big-eared bat *Corynorhinus t. townsendii*	CSC/ -														R	R	R	R
Yuma (San Joaquin) myotis *Myotis yumanensis*	CSC/ -														R	R	R	R
S.F. dusky-footed woodrat *Neotoma fuscipes annectens*	CSC/ -										N	N		N	N*	N	N	N*

TABLE 3.2-5 (Continued)
SPECIAL STATUS SPECIES LIKELY TO OCCUR IN THE SAN VICENTE CREEK WATERSHED

Common Name *Scientific Name*	**State/ Federal Status**	**SVB-1**	**SVCT-1**	**SVCT-2**	**SVCT-3**	**SVP-1**	**SVP-2**	**SVS-1**	**SVSPZ-1**	**SVW-1**	**SVW-2**
California red-legged frog *Rana aurora draytonii*	CSC/ FT		B*	B		B*		B	NB		
Peregrine falcon (nesting) *Falco peregrinus*	SE, CFP, 3503.5/ FD	F									
Western snowy plover Charadrius alexandrinus	CSC/ FT	N									
Western pond turtle *Clemmys marmorata*	CSC/ -			A					A		
Double-crested cormorant (rookery) *Phalacrocorax auritus*	CSC/ -										
Cooper's hawk (nesting) *Accipiter cooperi*	CSC, 3503.5/ -			F		F	F	N	N	N	N
Sharp-shinned hawk (nesting) *Accipiter striatus*	CSC, 3503.5/ -								N		N
Golden eagle *Aquila chrysaetos*	CSC, CFP. 3503.5/ -		F	F	F	F	F	F		N	
Ferruginous hawk (wintering) *Buteo regalis*	CSC/ FSC						W	W			
Northern harrier (nesting) *Circus cyaneus*	CSC/-		F	F	F	F	F	F			
White-tailed kite (nesting) *Elanus leucurus*	CFP, 3503.5/ FSC		F	F	F	F	F	N	N	N	N
Merlin (wintering) *Falco columbarius*	CSC/ -	W	W	W	W	W	W	W			
Long-eared owl (nesting) *Asio otus*	CSC/ -								N		
Rhinoceros auklet *Cerorhinca monocerata*	CSC/ -										
Vaux's swift *Chaetura vauxi*	CSC/ FSC										N

TABLE 3.2-5 (Continued)
SPECIAL STATUS SPECIES LIKELY TO OCCUR IN THE SAN VICENTE CREEK WATERSHED

Common Name *Scientific Name*	**State/ Federal Status**	**SVB-1**	**SVCT-1**	**SVCT-2**	**SVCT-3**	**SVP-1**	**SVP-2**	**SVS-1**	**SVSPZ-1**	**SVW-1**	**SVW-2**
Black swift *Cypseloides niger*	CSC/ FSC	N									
Olive-sided flycatcher *Contopus borealis*	-/ FSC							N		N	N
Loggerhead shrike *Lanius ludovicianus*	CSC/ FSC					N	N	N		N	
California horned lark *Eremophila alpestris actia*	CSC/ -					N	N	N			
Yellow warbler *Dendroica petechia brewsteri*	CSC/ FSC								N		
Saltmarsh common yellowthroat *Geothlypis trichas sinuosa*	CSC/ -										
Grasshopper sparrow (nesting) *Ammodramus savannarum*	-/ FSC					N	N	N			
Tricolored blackbird (nesting) *Agelaius tricolor*	CSC/ FSC										
Pallid bat *Antrozous pallidus*	CSC/ -							R	R	R	R
Townsend's western big-eared bat *Corynorhinus t. townsendii*	CSC/ -							R	R	R	R
Yuma (San Joaquin) myotis *Myotis yumanensis*	CSC/ -							R	R	R	R
S. Francisco dusky-footed woodrat *Neotoma fuscipes annectens*	CSC/ -					N	N	N*	N	N*	N*

TABLE 3.2-5 (Continued)
SPECIAL STATUS SPECIES LIKELY TO OCCUR IN THE LIDDELL CREEK WATERSHED

Common Name *Scientific Name*	**LB-1**	**LB-2**	**LCTB-1**	**LCTB-2**	**LCT-1**	**LCT-2**	**LP-1**	**LP-2**	**LP-3**	**LS-1**	**LS-2**	**LS-3**	**LSPZ-1**	**LSPZ-2**	**LW-1**	**LW-2**	**LW-3**	**LW-4**
California red-legged frog *Rana aurora draytonii*						B*	B						NB	B*, NB*			NB*	
Peregrine falcon (nesting) *Falco peregrinus*	F	F																
Western snowy plover Charadrius alexandrinus		N																
Western pond turtle *Clemmys marmorata*													A	A				
Double-crested cormorant (rookery) *Phalacrocorax auritus*																		
Cooper's hawk (nesting) *Accipiter cooperi*					F	F	F	F	F	F	F	F	N	N	N	N	N	N
Sharp-shinned hawk (nesting) *Accipiter striatus*													N	N	N	N	N	N
Golden eagle *Aquila chrysaetos*			F	F	F	F	F	F	F	F	F	F			F			
Ferruginous hawk (wintering) *Buteo regalis*							W	W	W									
Northern harrier (nesting) *Circus cyaneus*			F	F	F	F	F	F	F	F	F	F			F			
White-tailed kite (nesting) *Elanus leucurus*			F	F	F	F	N	F	F	N	N	F			N	N	N	N
Merlin (wintering) *Falco columbarius*	W	W	W	W	W	W	W	W	W	W	W							
Long-eared owl (nesting) *Asio otus*													N	N				
Rhinoceros auklet *Cerorhinca monocerata*																		
Vaux's swift *Chaetura vauxi*															N	N	N	N

TABLE 3.2-5 (Continued)
SPECIAL STATUS SPECIES LIKELY TO OCCUR IN THE LIDDELL CREEK WATERSHED

Common Name *Scientific Name*	**LB-1**	**LB-2**	**LCTB-1**	**LCTB-2**	**LCT-1**	**LCT-2**	**LP-1**	**LP-2**	**LP-3**	**LS-1**	**LS-2**	**LS-3**	**LSPZ-1**	**LSPZ-2**	**LW-1**	**LW-2**	**LW-3**	**LW-4**
Black swift *Cypseloides niger*	N	N																
Olive-sided flycatcher *Contopus borealis*															N	N	N	N
Loggerhead shrike *Lanius ludovicianus*					N	N	N	N	N	N	N	N						
California horned lark *Eremophila alpestris actia*							N	N	N									
Yellow warbler *Dendroica petechia brewsteri*													N	N				
Saltmarsh common yellowthroat *Geothlypis trichas sinuosa*																		
Grasshopper sparrow (nesting) *Ammodramus savannarum*							N	N	N									
Tricolored blackbird (nesting) *Agelaius tricolor*																		
Pallid bat *Antrozous pallidus*										R	R	R	R	R	R	R	R	R
Townsend's western big-eared bat *Corynorhinus t. townsendii*										R	R	R	R	R	R	R	R	R
Yuma (San Joaquin) myotis *Myotis yumanensis*										R	R	R	R	R	R	R	R	R
S. Francisco dusky-footed woodrat *Neotoma fuscipes annectens*					N	N	N	N	N	N	N	N	N	N	N	N	N	N

TABLE 3.2-5 (Continued)
SPECIAL STATUS SPECIES LIKELY TO OCCUR IN THE YELLOW BANK CREEK WATERSHED

Common Name ***Scientific Name***	**State/** **Federal Status**	**YBB-1**	**YBCTB-1**	**YBCT-1**	**YBCT-2**	**YBP-1**	**YBP-2**	**YBS-1**	**YBS-2**	**YBSPZ-1**	**YBW-1**	**YBW-2**
California red-legged frog *Rana aurora draytonii*	CSC/ FT									B*, NB*		
Peregrine falcon (nesting) *Falco peregrinus*	SE, CFP, 3503.5/ FD	F										
Western snowy plover *Charadrius alexandrinus*	CSC/ FT											
Western pond turtle *Clemmys marmorata*	CSC, CP/ -									A		
Double-crested cormorant (rookery) *Phalacrocorax auritus*	CSC/ -											
Cooper's hawk (nesting) *Accipiter cooperi*	CSC, 3503.5/ -					F	F	F	F	N	N	N
Sharp-shinned hawk (nesting) *Accipiter striatus*	CSC, 3503.5/ -									N	N	N
Golden eagle *Aquila chrysaetos*	CSC, CFP, 3503.5/ -		F	F	F	F	F	F	F			
Ferruginous hawk (wintering) *Buteo regalis*	CSC/ FSC					W	W					
Northern harrier (nesting) *Circus cyaneus*	CSC/-		F	F	F	F	F	F	F			
White-tailed kite (nesting) *Elanus leucurus*	CFP, 3503.5/ FSC		F	F	F	F	F	N	N		N	N
Merlin (wintering) *Falco columbarius*	CSC/ -		W	W	W	W	W					
Long-eared owl (nesting) *Asio otus*	CSC/ -									N		
Rhinoceros auklet *Cerorhinca monocerata*	CSC/ -											
Vaux's swift *Chaetura vauxi*	CSC/ FSC										N	N

TABLE 3.2-5 (Continued)
SPECIAL STATUS SPECIES LIKELY TO OCCUR IN THE YELLOW BANK CREEK WATERSHED

Common Name *Scientific Name*	**State/ Federal Status**	**YBB-1**	**YBCTB-1**	**YBCT-1**	**YBCT-2**	**YBP-1**	**YBP-2**	**YBS-1**	**YBS-2**	**YBSPZ-1**	**YBW-1**	**YBW-2**
Black swift *Cypseloides niger*	CSC/ FSC	N										
Olive-sided flycatcher *Contopus borealis*	-/ FSC										N	N
Loggerhead shrike *Lanius ludovicianus*	CSC/ FSC			N		N	N	N	N			
California horned lark *Eremophila alpestris actia*	CSC/ -					N	N					
Yellow warbler *Dendroica petechia brewsteri*	CSC/ FSC									N		
Saltmarsh common yellowthroat *Geothlypis trichas sinuosa*	CSC/ -											
Grasshopper sparrow (nesting) *Ammodramus savannarum*	-/ FSC					N	N					
Tricolored blackbird (nesting) *Agelaius tricolor*	CSC/ FSC									N		
Pallid bat *Antrozous pallidus*	CSC/ -							R	R	R	R	R
Townsend's western big-eared bat *Corynorhinus t. townsendii*	CSC/ -							R	R	R	R	R
Yuma (San Joaquin) myotis *Myotis yumanensis*	CSC/ -							R	R	R	R	R
S. Francisco dusky-footed woodrat *Neotoma fuscipes annectens*	CSC/ -			N		N	N	N	N	N	N	N

TABLE 3.2-5 (Continued)
SPECIAL STATUS SPECIES LIKELY TO OCCUR IN THE LAGUNA CREEK WATERSHED

Common Name ***Scientific Name***	**State/** **Federal Status**	**LAB-1**	**LACTB-1**	**LACT-1**	**LAM-1**	**LAP-1**	**LAS-1**	**LAS-2**	**LASPZ-1**	**LASPZ-2**	**LASPZ-3**	**LASPZ-4**	**LAW-1**	**LAW-2**	**LAW-3**	**LAW-4**
California red-legged frog *Rana aurora draytonii*	CSC/ FT				B				NB	NB	NB*	NB				
Peregrine falcon (nesting) *Falco peregrinus*	SE, CFP, 3503.5/ FD	F														
Western snowy plover Charadrius alexandrinus	CSC/ FT	N*														
Western pond turtle *Clemmys marmorata*	CSC/ -				A				A	A	A	A				
Double-crested cormorant (rookery) *Phalacrocorax auritus*	CSC/ -															
Cooper's hawk (nesting) *Accipiter cooperi*	CSC, 3503.5/ -					F	F	F	N	N	N	N	N	N	F	F
Sharp-shinned hawk (nesting) *Accipiter striatus*	CSC, 3503.5/ -								N	N			N	N		
Golden eagle *Aquila chrysaetos*	CSC, CFP, 3503.5/ -		F	F		F	F	F								
Ferruginous hawk (wintering) *Buteo regalis*	CSC/ FSC					W		W						W		
Northern harrier (nesting) *Circus cyaneus*	CSC/-		F	F	N*	F	F	F								
White-tailed kite (nesting) *Elanus leucurus*	CFP/ FSC		F	F	F	F	N	F	N	N			N	N	F	F
Merlin (wintering) *Falco columbarius*	CSC/ -	W	W	W	W	W	W	W						W		
Long-eared owl (nesting) *Asio otus*	CSC/ -								N	N						
Rhinoceros auklet *Cerorhinca monocerata*	CSC/ -															
Vaux's swift *Chaetura vauxi*	CSC/ FSC												N	N		

TABLE 3.2-5 (Continued)
SPECIAL STATUS SPECIES LIKELY TO OCCUR IN THE LAGUNA CREEK WATERSHED

Common Name ***Scientific Name***	**State/ Federal Status**	**LAB-1**	**LACTB-1**	**LACT-1**	**LAM-1**	**LAP-1**	**LAS-1**	**LAS-2**	**LASPZ-1**	**LASPZ-2**	**LASPZ-3**	**LASPZ-4**	**LAW-1**	**LAW-2**	**LAW-3**	**LAW-4**
Black swift *Cypseloides niger*	CSC/ FSC	N														
Olive-sided flycatcher *Contopus borealis*	-/ FSC												N	N		
Loggerhead shrike *Lanius ludovicianus*	CSC/ FSC		N	N		N	N	N					N	N	N	N
California horned lark *Eremophila alpestris actia*	CSC/ -					N								N		
Yellow warbler *Dendroica petechia brewsteri*	CSC/ FSC															
Saltmarsh common yellowthroat *Geothlypis trichas sinuosa*	CSC/ -				N											
Grasshopper sparrow (nesting) *Ammodramus savannarum*	-/ FSC					N								N		
Tricolored blackbird (nesting) *Agelaius tricolor*	CSC/ FSC				N											
Pallid bat *Antrozous pallidus*	CSC/ -						R	R	R	R		R	R	R		
Townsend's western big-eared bat *Corynorhinus t. townsendii*	CSC/ -						R	R	R	R		R	R	R		
Yuma (San Joaquin) myotis *Myotis yumanensis*	CSC/ -						R	R	R	R		R	R	R		
S. Francisco dusky-footed woodrat *Neotoma fuscipes annectens*	CSC/ -			N		N	N	N	N	N	N	N	N*	N*		

TABLE 3.2-5 (Continued)
SPECIAL STATUS SPECIES LIKELY TO OCCUR IN THE LAGUNA CREEK WATERSHED

Status Codes:

Status -	State	SE	State-listed as Endangered under California Endangered Species Act (CESA)
		ST	State-listed as Threatened under CESA
		SCE	State candidate for listing as Endangered
		SCT	State candidate for listing as Threatened
		CSC	California Special Concern species designated by the Department of Fish and Game
		CFP	Fully Protected Species under the Fish and Game Code of California
		3503.5	No harm to raptor nests or eggs
Status -	Federal	FE	Federally-listed as Endangered under Federal Endangered Species Act (ESA)
		FT	Federally-listed as Threatened under ESA
		FPE	Federally proposed for listing as Endangered under ESA
		FPT	Federally proposed for listing as Threatened under ESA
		FD	Federally delisted
		FC	Federal candidate species (former Category 1 candidates)
		FSC	Federal Species of Concern

Potential Habitat Codes:

B	Breeding Habitat (Cal. Red-Legged Frog)
NB	Non-breeding habitat (Cal. Red-Legged Frog)
A	Aquatic habitat (Western Pond Turtle)
F	Foraging habitat (Raptors)
N	Nesting habitat (Birds, SF Wood Rat)
W	Wintering habitat (Special-status Raptors)
R	Roosting habitat (Bats)
*	Presence confirmed (CNDDB; pers. comm.; pers. obs.)

3.2.4 UNIQUE HABITATS AND ASSOCIATIONS

3.2.4.1 RAPTORS

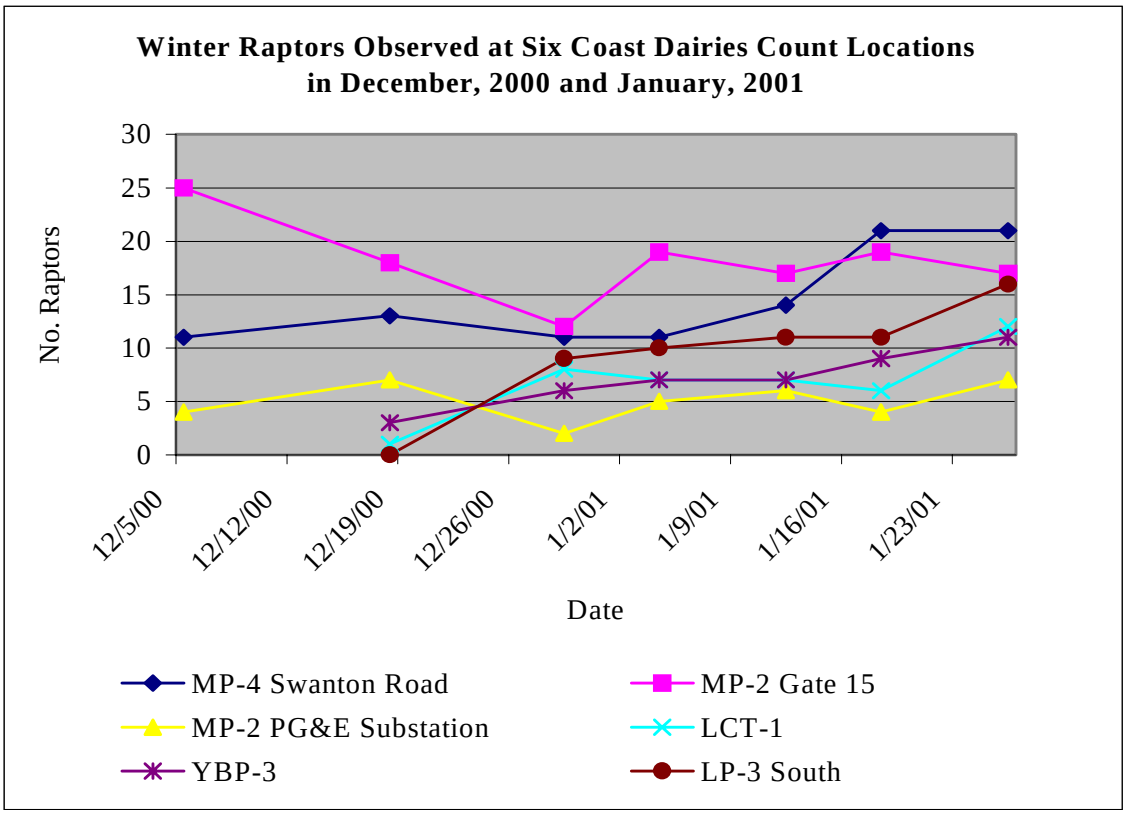
The area of highest raptor use observed from the MP-4 and MP-2 count locations were the fields in the elevation transition zone from the interior boundary of the first bench (which is roughly defined by Highway 1) to the second bench between Molinas Creek and the paved road through Gate 15 (see Figure 3.2-1).

This general area is under three different management regimes, which appear to have affected the vegetation, raptor prey base and raptor use in a fairly limited area. MP-2 was recently cultivated and had little raptor use. MCT-3 appears to have been cultivated in the recent past (perhaps in the 1999 growing season) and lay fallow in 2000. It contained tall, dense stands of herbaceous plant stalks. Raptor use of this area was intermediate between cultivated land and grazed areas. Habitat in the western "arm" of MP-4 consisted of dense grasses and moderate stands of herbaceous plant stalks. The main difference between MP-4 and MCT-3 was the grass layer, which was altogether absent in MCT-3. Raptors were clearly most abundant in MP-4. Many raptors were observed standing and foraging on the ground or perched on low fence posts. This behavior suggests that they were foraging on pocket gophers (*Thomomys bottae*).

Although we performed no statistical tests, the preponderance of raptor use in MP-2 and MP-4 as shown by Table 3.2-6 and the chart below suggested that it be deemed unique for the Property and a management priority (see Figure 3.2-1).

TABLE 3.2-6
WINTER RAPTORS OBSERVED AT SIX COAST DAIRIES COUNT LOCATIONS

Date	MP-4 Swanton Road	MP-2 Gate 15	MP-2 PG&E Substation	LCT-1	LP-3	YBP-2	Total
December 5, 2000	11	25	4				40
December 18, 2000	13	18	7	1	3	0	42
December 29, 2000	11	12	2	8	6	9	48
January 4, 2001	11	19	5	7	7	10	59
January 12, 2001	14	17	6	7	7	11	62
January 18, 2001	21	19	4	6	9	11	70
January 26, 2001	21	17	7	12	11	16	84



3.2.5 SUMMARY ANALYSIS ZONE EVALUATIONS

Nine analysis zones out of a total of 70 had an opportunity score of "3" (*unique wildlife resources present*) on the five watersheds. All but two of these (MSPZ-1; LASPZ-3) also scored "3" in the constraints assessment (*disturbance could diminish the wildlife resource*). They are displayed in Table 3.2-7 below.

TABLE 3.2-7
ANALYSIS ZONES WITH UNIQUE WILDLIFE RESOURCES PRESENT

Analysis Zone	Descriptive Criteria
Molino Watershed	
MB-1 (Coast Daires' Portion of Scotts Creek Beach)	Snowy plover nesting and wintering habitat.
MSPZ-1 (Molino Creek riparian area)	California red-legged frog (CRLF) breeding habitat and riparian-associated resources.
San Vicente Watershed	
SVSPZ-1 (San Vicente Creek riparian area)	Riparian-associated resources.
Liddell Watershed	
LSPZ-1 (Liddell Creek riparian area – West Branch)	Raptor nesting, special status bat species, and riparian-associated resources.
LSPZ-2 (Liddell Creek riparian area – East Branch)	Raptor nesting, nearby CRLF breeding areas, and riparian-associated resources.

TABLE 3.2-7 (Continued)
ANALYSIS ZONES WITH UNIQUE WILDLIFE RESOURCES PRESENT

Analysis Zone	Descriptive Criteria
Yellow Bank Watershed	
YBSPZ-1 (Yellow Bank Creek riparian area)	Intact native habitats (alder riparian) throughout zone; potential yellow warbler nesting; nearby CRLF breeding area, and riparian-associated resources
LAM-1 (Laguna Creek Marsh)	Productive marsh habitat rare in region; nesting habitat for tricolored blackbird.
Laguna Watershed	
LAB-1 (Laguna Beach)	Snowy plover nesting and wintering habitat.
LASPZ-1 and 3 (Laguna Creek Riparian Areas)	Raptor and potential yellow warbler nesting, CRLF non-breeding habitat; S.F. dusky-footed woodrat; and riparian-associated resources.

3.2.6 ISSUES

3.2.6.1 ISSUES IDENTIFIED BY THE COMMUNITY ADVISORY GROUP

Prior to the formation of the Planning Team, the Trust for Public Land was assisted in its early project scoping by members of the Community Advisory Group (CAG) (see Section 3.1.5.1). The CAG Habitat Preservation and Enhancement Subcommittee presented to TPL a summary of an April 24, 2000 meeting, which listed the following priorities relevant to terrestrial wildlife resources:

- replacing livestock grazing with native herbivores (e.g., tule elk);
- rehabilitating mined areas; and
- establishing ongoing research programs for livestock grazing and similar uses.

3.2.6.2 FERAL PIGS

Wild pigs (*Sus scrofa*) in California have a long and (for them) successful history. There are two source populations for this non-native omnivore. They were first free-ranged in oak woodlands near the Spanish Missions in the late 1700s; then, in 1925 in Monterey County, Eurasian wild boar were released for sport hunting. More boar were released in the 1950s and apparently interbred with the wild pigs of Spanish descent. From 10 coastal counties in the 1960s, 49 of 58 California counties now have populations (Waithman et al., 1999); rooting can threaten endemic plant populations; and they can compete with native species for forage

Although studies of pig diets in California show them to be primarily herbivorous (Schauss, 1980; Baber, 1985) pigs are true omnivores. Moreover, although habitat use may show preferences for oak woodlands (acorns are a major food source) and cool canyon bottoms in summer (pigs have no sweat glands) they can move widely and essentially appear anywhere within a very extensive home range. Where they forage they inevitably "root" – probe with their snouts underground for roots, bulbs and invertebrates. Sediment yields from rooted plots can be two or three times as high as ambient erosion; non-native species increase (LCA, 1987). At least hypothetically, they compete with native wildlife for food and can be reservoirs of disease (Waithman et al., 1999). The species is also difficult and expensive to eradicate. A long-term plan for managing pig populations, perhaps in concert with other park jurisdictions, will be a priority for the future managers of Coast Dairies.

3.2.6.3 DATA GAPS

The ECR attempted to develop substantial baseline information in limited areas, and general information over all the Property, to assist planners and the ultimate land managers. Between the work of the PRBO and the Santa Cruz Bird Club, the area is ornithologically well studied. Large and small mammals, especially carnivores with extensive home ranges (fox, bobcat and mountain lion) have not been adequately inventoried.

There is little information on the invertebrates present at Coast Dairies. Of these, Ohlone tiger beetle (*Cicindela ohlone*), a species proposed for federal listing in February, 2000, is a species which may be present and be affected by management. The tiger beetle inhabits areas characterized by remnant stands of native grassland associated with sunny areas of bare or sparsely vegetated ground. The beetle was observed at two locations within 10 miles (ESA, 1997) and habitat appears generally suitable. Monarch butterfly (*Danaus plexippus*), a California "Special Animal" overwinters at Natural Bridges State Park, a major center for this activity, and uses wooded stands of mixed height and trunk diameter, as well as understory brush. There is a small overwintering population between Davenport and the RMC plant, in a stand of eucalyptus. San Francisco lacewing (*Northochrysa californica*), a federal Species of Concern, is reported throughout much of the Coast Range from Mendocino to Los Angeles, associated with woodlands and coastal scrub habitats. Little is known about its biology or the shrinking geographic range.

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3.3 FISHERIES RESOURCES

Fisheries are clearly a pre-eminent concern on the Coast Dairies Property. Of the six perennial watersheds situated partially or entirely within Coast Dairies Property lines, San Vicente Creek is arguably the most significant in terms of fisheries resources. San Vicente Creek not only supports a self-sustaining population of federally threatened steelhead (*Oncorhynchus mykiss*), but also contains one of the last remnant populations of the state endangered coho salmon (*Oncorhynchus kisutch*) south of San Francisco Bay. Although degradation of fish habitat on the Property has been substantial, significant habitat quality remains, and the potential for stream and riparian restoration on these creeks is high.

The six distinct Coast Dairies watersheds are, from north to south, Molino Creek, Ferrari Creek, San Vicente Creek, Liddell Creek, Yellow Bank Creek, and Laguna Creek[1]. Although anadromous (ocean-maturing) salmonids (salmon and steelhead) have been observed in only a few of the Coast Dairies streams during recent surveys, particularly San Vicente Creek and Liddell Creek, there is little doubt that (a) historic populations were significantly larger than those recently reported, and (b) most, if not all, of the six streams historically supported salmonid populations.

Various stream and fisheries surveys have been conducted on the Property over the past two decades. While the information gathered in these studies provides valuable background information, the different researchers typically used varying approaches to investigate varying issues. Until the preparation of this Existing Conditions Report(ECR), there has been no effort at a consistent, across-the-board approach at assessing all streams and watersheds located on the Coast Dairies Property. As such, the primary focus of this Fisheries Resources section is the evaluation of the aquatic habitat conditions prevalent throughout the Property. As mentioned above, all of the watersheds are almost certain to have supported anadromous salmonids in the past. In accordance with this assumption, the Planning Team did not conduct any fish surveys to inventory species and population sizes, an exercise that not only unnecessarily stresses fish, but also provides little information about a stream's potential for supporting special status and common fish. While all observations of fish were noted during field surveys, we concentrated on determining the existing habitat suitability and diversity and identifying limiting factors that may prevent aquatic habitats from functioning optimally. Once restoration needs have been identified and planned, pre- and post-implementation fish surveys may be an appropriate method of determining the success (or lack thereof) of the restoration, and also be part of an Adaptive Management program. Until then, this report assumes that all Coast Dairies streams are capable of supporting a healthy and sustainable native fish population once adequately restored.

[1] Continuing uncertainty about the exact location of the Coast Dairies Property line has made it unclear whether or not portions of lower Scotts Creek, located north of Molino Creek, are within the boundaries. For the purpose of this chapter, we have assumed that it is not part of Coast Dairies.

3.3.1 REGIONAL SETTING

3.3.1.2 COASTAL WATERSHEDS SOUTH OF SAN FRANCISCO BAY

Factors such as topography, rainfall and temperatures of central California watersheds create somewhat different habitat characteristics for anadromous salmonids than those found in other regions of California. These natural conditions need to be taken into consideration when attempting to formulate effective fisheries management and restoration strategies for these streams.

The watersheds of the San Mateo and Santa Cruz County coast originate in the Santa Cruz Mountains, which are located relatively close to the Pacific Ocean. As such, the streams of this area typically drain small watersheds and, because of their relatively short length, are referred to as "short-run streams." The San Lorenzo River watershed, one of the biggest in central California, encompasses only about 138 square miles and the mainstem is a little over 26 miles long. In comparison, San Vicente Creek watershed has a total area of only about 11 square miles and mainstem length of approximately 9 miles (CDFG, 1998). The small size of the watersheds provides less usable habitat for fisheries than the large watersheds of Northern California -- the Russian River, for example.

The Santa Cruz Mountains typically receive less rainfall than northern ranges and this, combined with the small watershed areas, provides for less run-off and thus limited water availability. Furthermore, the higher average summer temperatures encountered in central California, combined with limited stream flows, expose local fish to considerably higher temperatures than are experienced by northern populations. The reduction of riparian vegetation often associated with agricultural and residential developments reduces stream shading and exacerbates high water temperatures. Summer stream temperatures are one of the most prevalent limiting factors for salmonids in general and coho salmon in particular.

Not only do central California streams receive less total rainfall, but the typical wet season is also shorter than in the north. Significant storms that provide sufficiently high stream flows for adult salmonid spawning migrations usually do not occur until December or January. During the late summer, significant portions of some coastal streams dry out, with only subterranean flows persisting. Fish habitat during this time is often restricted to isolated pools.

These challenging natural conditions have historically made central California streams less hospitable to coho salmon and steelhead than watersheds located in Northern California. When anthropogenic disturbances such as water diversions and the destruction of riparian vegetation are superimposed on these environmental factors, the survival of anadromous salmonids and other native fish species becomes increasingly difficult.

3.3.2 METHODOLOGY

3.3.2.1 FIELD SURVEYS

Reconnaissance level stream surveys were conducted during late April/early May, 2001 on the mainstems of the six perennial watersheds (Molino, Ferrari, San Vicente, Liddell, Yellow Bank, and Laguna creeks), as well as on one major tributary to Laguna Creek (Y Creek). Only stream portions located within the Coast Dairies Property boundary were surveyed, although any pertinent, existing information on stream conditions upstream of the Property was also gathered and incorporated into the existing conditions analysis. The intent of these surveys was to provide a general overview of channel geomorphology and aquatic habitat conditions in these watersheds and to identify areas of disturbance (migration barriers, sedimentation, water withdrawals, etc.) as well as potential habitat restoration sites. While a far more time- and labor-intensive effort would be required to gather all the information collected during a typical stream survey using California Department of Fish and Game (CDFG) protocols, reconnaissance level surveys provide sufficient information to derive basic but important conclusions about the relative health of the aquatic habitats and allow land managers to focus future research efforts on identified problem areas.

The methodology for the reconnaissance surveys was adapted from the more detailed *California Salmonid Stream Habitat Restoration Manual* (Flosi et al., 1998) habitat inventory methods. Each creek was walked in its entirety (within the Property boundary) and divided into distinct reaches based on overall topography, channel geomorphology, and riparian vegetation. Each reach was then characterized using the following quantitative and qualitative parameters:

- overall geomorphology (channel width, depth, riffle/run/pool abundance),
- substrate characteristics (substrate size, embeddedness),
- riparian corridor (width, predominant species, percent channel shading),
- salmonid habitat type (migratory, spawning, rearing),
- cover availability (undercut banks, large woody debris, instream vegetation), and
- visible disturbances (e.g., erosion/sedimentation, water withdrawals, salmonid migration barriers, etc.).

While no specific fish surveys were conducted for this task, all coincidental streamside observations of fish were recorded. While most, if not all, observed fish appeared to be steelhead, we elected to refer to the observations as “salmonids”, since the differentiation of juvenile coho salmon, steelhead, and potential resident rainbow trout is difficult without capturing representative specimens.

Representative photographs and Global Positioning System (GPS) coordinates were taken at each stream reach and at identified sites of disturbance. For the purposes of this ECR, the data

gathered during the surveys will be summarized in Section 3.3.4 below. The actual data sheets will be included in the Project Archives.

3.3.2.2 INSTREAM FLOW REQUIREMENTS

Various methodologies are available for determining instream minimum flow requirements for salmonids. These range from the highly time- and labor-intensive Instream Flow Incremental Methodology (IFIM) to the fairly rapid "60 percent of unimpaired mean annual flow" method. All methods appear to have advantages and disadvantages and typically result in somewhat different flow requirements. Recognizing the site-specific nature of existing and future diversion projects, we did not attempt to set finite minimum flow requirements for Coast Dairies streams. Instead, we used a relatively new methodology to derive preliminary bypass flow values that can be used as a screening tool to aid in future water rights negotiations.

The methodology used to estimate the instream flow requirements for Coast Dairies streams is currently under development by the National Marine Fisheries Service (NMFS) and has been proposed for adoption by the State Water Resources Control Board for use in processing water rights applications (SWRCB, 2001). The method consists of using the median February flow level, determined from historical flow records, as the level of bypass flows necessary for protecting fisheries resources. Two of the Coast Dairies streams, San Vicente and Laguna Creek, have had stream gauges operated by the U.S. Geological Survey (USGS) in the past. Data collected at these gauges (although located upstream of the Property boundary), as well as data from Scotts Creek just north of the Property and Majors Creek located immediately south of the Property, determined the regional February median flow. Stream-specific February median flows for the ungauged streams on the Property were then extrapolated from the regional data by adjusting for watershed runoff areas.

A further component of this methodology is the determination of the maximum cumulative instantaneous diversion rate (i.e., the maximum combined withdrawal rate of all diversion sites located within one watershed and operated at the same time). For the Coast Dairies streams, team biologists set this rate at 20 percent of the "20 percent winter exceedance flow" (Edmondson pers. comm., 2000-2001). The "20 percent winter exceedance flow" refers to the daily discharge (flow) level that is met or exceeded on only 20 percent of winter days (December 15 through March 31). For example, the historic flow records of a given stream may indicate that during an average winter year 20 percent of the days recorded a stream flow equal to or greater than 10 cubic feet per second (cfs). Thus the "20 percent winter exceedence flow" is 10 cfs and the allowable maximum cumulative instantaneous diversion rate is 2 cfs (20 percent of 10 cfs).

3.3.3 SPECIAL STATUS FISH SPECIES

3.3.3.1 COHO SALMON

Coho salmon (*Oncorhynchus kisutch*) that are part of the central California coast Evolutionarily Significant Unit (ESU) of the species are federally listed as threatened and state listed as endangered south of San Francisco Bay. Historically, coho were widespread, inhabiting most major river basins around the Pacific Rim from central California to Korea and Japan. Coho salmon exhibit a trait common to many species in being most abundant in the central portion of their range and less common in the northern and southern fringes of their natural distribution (CDFG, 1998). California represents the southern margin of the species' natural distribution and coastal streams of Santa Cruz County constitute the very southern extent of coho. Historically, coho salmon are believed to have used all or most of the accessible coastal streams along the San Mateo and Santa Cruz County coastline[2]. However, habitat destruction and degradation, as well as changes in oceanic conditions and increased pinniped predation, among other reasons, have brought coho salmon to the brink of extinction in this area (CDFG, 1998; Weitcamp et al., 1995). At present, natural and self-sustaining runs of coho south of San Francisco Bay are believed to occur only in Gazos, Waddell, and Scotts Creeks (CDFG, 1998)[3]. In response to the documented critical condition of native coho runs in San Mateo and Santa Cruz counties, CDFG (1998) has developed a draft restoration plan for the species in this area. The restoration plan states that:

"*Available information indicates that the southern coho are in great jeopardy. This group of fish has probably declined in overall abundance by more than 95 percent from historical levels, have been extirpated from most of the streams they once inhabited, and are still being exposed to a host of unfavorable conditions that threaten their continued existence*."

Coho spawning migrations from the ocean to freshwater streams or rivers usually begin after the first heavy rains in late fall or winter have opened sand bars (where present[4]) at the mouths of the creeks. The timing of their migration varies somewhat throughout their range, but in the short coastal streams of central California, coho typically return to freshwater during November through February. Females construct redds (spawning "nests") near the head of a riffle in substrate consisting of gravel and small cobble. Newly hatched fry (embryos) remain in the interstices of the gravel for approximately three weeks before emerging and schooling in still, shallow water along stream margins. As they grow and become known as parr during the spring, juvenile coho disperse to pools where they set up individual territories. After spending the following summer, fall and winter in the stream, the immature yearling coho begin to migrate

[2] In the spring of 2001, Dr. Kenneth Gobalet of California State University, Bakersfield wrote a brief, unpublished document discussing the absence of coho remains at archaeological sites south of San Francisco. One of the sites (SCR-117: see Section 5.6) was noted as containing steelhead but not coho. While emphasizing that "absence of evidence is not the evidence of absence" he stated that, "To this point the lack of data are consistent with the position that no coho or chinook salmon were prehistorically present in any streams south of San Francisco."

[3] More recent survey data collected on these three streams actually put the self-sustainability of these coho runs in serious doubt (Smith, 2001).

[4] San Vicente Creek is the only coho stream south of San Francisco Bay that does not have a sand bar at its mouth. This is due to its redirection through a bedrock tunnel.

downstream toward the ocean in spring. During this time, juveniles undergo smoltification, the process of adapting to the marine environment. After two years of growing and sexually maturing in the ocean, coho return to their natal streams as three-year-olds to begin the life cycle again.

This three-year cycle is fairly rigid among coho who, unlike steelhead, rarely spend less than two years in the ocean. Since all wild female coho are three years old when spawning, there are three distinct and separate maternal brood year lineages for each stream. For example, all coho produced in 1994 were progeny of females produced three years earlier in 1991, which in turn were progeny of females produced three years earlier in 1988, and so on. The three maternal brood year lineages are:

Brood Year Lineage I:	1988….1991….1994….1997.…2000….
Brood Year Lineage II:	1989….1992….1995….1998.…2001….
Brood Year Lineage III:	1990….1993….1996….1999.…2002….

This rigid life cycle has been cited as a major reason for coho salmon's greater vulnerability to catastrophic events compared to other salmonids (CDFG, 1998). Should a major event, such as El Niño floods or anthropogenic disturbance severely deplete coho stocks during one year, the effects will be noticed three years later when few or no surviving female coho return to continue the brood year lineage.

Occurrence on the Coast Dairies Property

Adult coho salmon have occasionally been observed in San Vicente Creek, one of nine streams south of San Francisco Bay identified by CDFG as potentially instrumental in restoring the region's coho runs to a state of sustainable viability. Currently, CDFG (1998) does not consider coho in San Vicente Creek as a reproducing and self-sustaining population. The following coho occurrences, listed in chronological order, have been recorded during the past two decades:

- an unknown number of coho were observed in 1981 by Harvey & Stanley Associates (1982);
- two migrating coho were observed in 1991 by McGinnis (1991); and
- CDFG found three juveniles of the 1993….1996 brood year in 1996, but observed none in 1997 (CDFG, 1998).

One of the long-term stream-specific goals of the CDFG restoration plan is the establishment of a viable coho salmon population of 50 naturally produced returning adults in San Vicente Creek (CDFG, 1998).

Regardless of whether or not coho salmon occur on any other Coast Dairies streams, NMFS has designated critical habitat for central California coast coho salmon in 1999 and all Coast Dairies streams are included in this listing. The designation covers "all waterways, substrate, and adjacent riparian zones below longstanding, naturally impassable barriers (i.e., natural waterfalls

in existence for at least several hundred years)," as well as some major dams (Fed. Reg., 1999). A critical habitat designation offers a similar level of protection to the habitat as a threatened or endangered designation affords a listed species, where federal agencies are either the land managers or are involved in permitting.

3.3.3.2 STEELHEAD

The central California coast steelhead (*Oncorhynchus mykiss*) Ecologically Significant Unit (ESU) is federally listed as threatened, and is a California Species of Concern.

The species *O. mykiss* exhibits varying degrees of anadromy. Nonanadromous forms of the species are usually known as rainbow trout while the anadromous form is called steelhead. Although rainbow trout and steelhead have long been classified within the same species, the former is not protected by state or federal regulations. Distinguishing the two forms in the field is difficult at best, thus complicating the determination of whether or not a listed species occurs within the stream where the observation is made. However, it is unusual for the two forms to co-occur in coastal watersheds, where they are typically separated by migration barriers (Busby et al., 1996). In cases where *O. mykiss* occur upstream of relatively recent barriers, such as the reservoir dams on some Coast Dairies streams, these landlocked populations are believed to be able to resume their migrating life cycle if the barriers were to be removed (Busby, 1996), and thus retain their status as threatened steelhead.

Steelhead migrate to marine waters after spending up to seven years in freshwater, although two to three years is more common (Busby, et al., 1996). They then typically reside in marine waters one to three years prior to returning to their natal stream to spawn as three- or four-year olds. Unlike salmon, steelhead are iteroparous, meaning they can spawn more than once before they die; in California, females commonly spawn twice before they die. The spawning season can run from December through May, depending on the stream, with most spawning occurring in January through March. The spawning, hatching, and rearing life stages are similar to those of coho salmon and other anadromous salmonids, although steelhead typically utilize a greater proportion of the watershed for spawning while coho generally reproduce in the low gradient coastal portions of streams.

Two reproductive forms of steelhead are recognized, the "stream maturing" and "ocean maturing" forms (also termed summer-run and winter-run, respectively), which describes the level of sexual development following return to the freshwater environment. The central California coast ESU consists entirely of winter-run steelhead (Busby et al., 1996).

Occurrence on the Coast Dairies Property

Recent observations have confirmed the presence of steelhead in three Coast Dairies streams: San Vicente Creek, Liddell Creek, and Laguna Creek (Harvey & Stanley Associates, 1982; McGinnis, 1991; CDFG, 1996, CNDDB, 2000). Harvey & Stanley Associates conducted the only study in which steelhead population data were collected on all three creeks during the same

season. Their surveys showed that San Vicente Creek contained the highest steelhead density while steelhead were least abundant in Liddell Creek.

In addition to these confirmed steelhead occurrences, Planning Team biologists made streamside observations of *O. mykiss* during the Spring 2001 stream reconnaissance surveys. Young-of-the-year and/or yearlings were observed in *all* surveyed creeks, including Y Creek. Some of these observations were made upstream of what appeared to be impassable or difficult-to-pass migration barriers, suggesting that some of the fish may be landlocked steelhead or resident rainbow trout.

NMFS also designated critical habitat for central California coast steelhead in 2000. The wording of the designation (Fed. Reg., 2000) is essentially identical to that used for coho salmon critical habitat and also includes all Coast Dairies streams.

3.3.3.3 TIDEWATER GOBY

The tidewater goby (*Eucyclogobius newberryi*) is listed federally as an endangered species and is a California Species of Special Concern. However, tidewater goby populations north of Orange County have been proposed for delisting by the U.S. Fish and Wildlife Service (USFWS) because more recent data collected on the species suggests that the original listing rule overestimated the species' risk of extinction (Fed. Reg., 2001). The delisting of the goby in northern and central California appears to be imminent and may take place prior to the completion of the Coast Dairies Long Term Resource Protection and Use Plan.

The tidewater goby is a benthic fish that inhabits shallow lagoons and the lower reaches of coastal streams. It differs from other species of gobies in California in that it is able to complete its entire life cycle in fresh to brackish water. This goby appears to be mainly an annual species, although individuals in the northern part of the range may live up to three years (Moyle et al., 1995).

Tidewater gobies typically inhabit areas of slow-moving water, avoiding strong wave actions or currents. Particularly important to the persistence of the species in lagoons is the presence of backwater, marshy habitats, as well as annual sandbar formation, to avoid being flushed out to the ocean during winter flood flows (J. Smith pers. comm., 1999). Preferred water temperatures generally range from 8-22°C and water depths are usually less than three feet.

The tidewater goby is endemic to California and is distributed in brackish water habitats along the coast from Agua Hedionda Lagoon, San Diego County, in the south to the mouth of the Smith River (Tillas Slough), Del Norte County, in the north (Moyle et al., 1995). Although the species was originally believed to be restricted to low-salinity waters (Fed. Reg., 1994), tidewater gobies are capable of living in saline waters reaching over 50 parts per thousand (ppt) (Moyle et al., 1995). Large populations have been observed in lagoons ranging from fresh water (e.g., Soquel Creek and Pescadero Creek) to ocean salinities (Corcoran Lagoon and Moran Lagoon) (J. Smith pers. comm., 2000-2001).

Occurrence on the Coast Dairies Property

Tidewater gobies are known to occur in the lagoon and downstream portion of Laguna Creek, as well as in Scotts Creek, just north of the Property boundary (CNDDB, 2000).

3.3.3.4 NON-LISTED FISH SPECIES

Several common and non-listed fish species have been observed on the Coast Dairies Property during past fisheries studies (Harvey & Stanley Associates, 1982; CDFG, 1996; CDFG, 1998). These include coast range sculpins (*Cottus aleuticus*), prickly sculpins (*Cottus asper*), and threespine sticklebacks (*Gasterosteus aculeatus*).

3.3.4 STREAM AND REACH INFORMATION

The following discussion of the Coast Dairies streams focuses on general stream characteristics and limiting factors for fisheries resources, primarily anadromous salmonids. Stream reach data collected during the April/May 2001 reconnaissance surveys are partially summarized in Table 3.3-1. The complete data sheets will be included in the Project Archives. The approximate locations of the stream reaches are depicted in Figures 3.3-1a through 3.3-1e.

The following terms are used throughout the stream reach discussion:

- *Embeddedness* refers to the degree to which larger substrate particles (boulders, cobble, gravel) are surrounded or covered by fine sediments (silt). A high degree of embeddedness creates sub-optimal spawning conditions.

- *Substrate* refers to the mineral and/or organic materials that form the bed (bottom)of the stream channel.

- *Large Woody Debris (LWD)* refers to large pieces of relatively stable woody material (e.g. fallen trees), having a diameter greater than 12 inches and a length greater than 6 feet, that intrude into the stream channel. LWD provides important cover for salmonids and may also create pool habitats.

3.3.4.1 MOLINO CREEK

Molino Creek represents the northern-most stream located on the Coast Dairies Property (see footnote on page 3.3-1) and empties into the Pacific Ocean at Scotts Creek Beach (Figure 3.3-1a). At the time of the survey, Reach 1 joined Scotts Creek prior to entering the ocean. Scotts Creek usually flows across the northwestern portion of the beach but its channel alignment shifted to the southeast during the 2000/2001 winter season. Based on visual inspection, the outlet of the concrete box culvert under Highway 1 (Reach 2) does not appear to present a migration barrier, although stream velocities during storm events are expected to be very high. Reach 3 is a natural channel with a good mixture of minor pools, riffles, and runs, providing both spawning and

rearing habitat. Approximately 10 salmonids were observed in this section of the stream. An off-channel reservoir is located near the southern bank of Reach 3. The inlet to the reservoir (start of

TABLE 3.3-1
COAST DAIRIES STREAM REACH CHARACTERISTICS

Stream Reach #	Average Channel Width (ft.)	Average Channel Depth (in.)	Average Pool Depth (ft.)	Habitat Types			Cover Type & Availability[a]			Substrate Characteristics		Channel Shading (%)	Potential Disturbances
				Pools (%)	Riffles (%)	Runs (%)	Under-cut Banks	Large Woody Debris	Instream Vegeta-tion	Size[b]	Em-bedded-ness (%)		
Molino													
Reach 1	8.0	3.5	<1.0	5	75	20	absent	absent	absent	sa	100	0	none observed
Reach 2	2.5	3.0	NA	0	0	100	absent	absent	absent	concrete	NA	100	none observed
Reach 3	5.5	5.5	<1.0	30	50	20	high	low	high	co/gr/sa	20	70	diversion
Reach 4	5.5	5.5	1.0	30	45	25	high	mod.	mod.	co/gr	25	60	none observed
Reach 5	4.5	5.0	<1.0	30	50	20	high	low	high	co/gr	35	65	reservoir/barrier
Reach 6	3.5	3.5	<1.0	30	40	30	high	mod.	mod.	co	10	65	none observed
Ferrari													
Reach 1	5.0	1.5	1.5	95	0	5	absent	absent	absent	sa/co	90	50	none observed
Reach 2	5.0	9.0	2.0	5	80	15	mod.	low	high	gr/co/sa	10	85	Hwy 1 culvert
Reach 3	5.0	8.0	1.5	35	35	30	low	absent	mod.	gr/co/sa	15	5	some erosion
Reach 4	5.0	7.0	1.5	15	60	25	mod.	mod.	low	co/gr/sa	10	70	diversion/barrier
Reach 5	5.0	6.0	1.0	5	65	30	mod.	absent	mod.	co/gr/sa	5	15	erosion/cattle
Reach 6	3.0	6.0	1.0	10	60	30	mod.	mod.	high	co/gr/sa	10	85	none observed
Reach 7	3.0	5.0	<1.0	5	80	15	mod.	mod.	high	co/gr	5	95	bank failure
Reach 8	3.0	3.5	<1.0	10	80	10	mod.	mod.	high	gr/co/bo	5	55	bank failures
Reach 9	dry	dry	dry	dry	dry	dry	low	high	absent	bo/co/gr	5	90	none observed
San Vicente													
Reach 1	2.0	24.0	2.0	90	0	10	high	absent	absent	sa	100	0	none observed
Reach 2	10.0	1.5	2.0	10	10	80	mod.	absent	absent	co/gr/sa	55	90	bore
Reach 3	11.0	1.5	2.5	20	60	20	high	high	mod.	co/gr/sa	60	70	withdrawal
Reach 4	11.0	1.5	2.5	15	55	30	mod.	mod.	low	co/gr/sa	40	50	withdrawal

[a] Cover availability rated in relative terms: absent, low, moderate (mod.), high.
[b] Size classes: Silt (si), sand (sa), gravel, (gr), cobble (co), boulder (bo), bedrock (br); table lists size classes in order of abundance

TABLE 3.3-1 (Continued)
COAST DAIRIES STREAM REACH CHARACTERISTICS

Stream Reach #	Average Channel Width (ft.)	Average Channel Depth (in.)	Average Pool Depth (ft.)	Habitat Types			Cover Type & Availability[a]			Substrate Characteristics		Channel Shading (%)	Potential Disturbances
				Pools (%)	Riffles (%)	Runs (%)	Under-cut Banks	Large Woody Debris	Instream Vegeta-tion	Size[b]	Em-bedded-ness (%)		
San Vicente (cont.)													
Reach 5	11.0	11.0	2.0	10	65	25	mod.	mod.	low	co/gr/sa	45	50	erosion/sediment
Reach 6	10.0	10.0	2.0	20	50	30	mod.	mod.	low	bo/co/gr	55	60	erosion/sediment
Liddell (Main Branch)													
Reach 1	9.0	4.5	<1.0	1	45	54	absent	absent	absent	sa/co	95	0	none observed
Reach 2	5.0	6.0	<1.0	0	0	100	absent	absent	absent	concrete	0	100	culvert/bore
Reach 3	7.0	9.0	2.0	35	40	25	high	high	mod.	co/gr/sa	40	75	sedimentation
Reach 4	6.5	7.0	2.0	30	50	20	high	high	mod.	gr/co/sa	55	70	bank failures
Reach 5	5.5	7.0	1.5	40	40	20	high	high	low	co/sa	65	75	bank failures
Reach 8	3.5	5.5	1.5	20	60	20	high	high	absent	gr/sa/si	75	90	sedimentation
Reach 9a	3.5	5.0	<1.0	40	40	20	mod.	mod.	low	sa/si/co	95	85	sediment./divers.
Reach 9b	2.5	3.0	NA	NA	NA	NA	high	high	low	sa/gr	75	85	none observed
Liddell (East Branch)													
Reach 6	5.0	5.5	1.5	35	35	30	high	high	low	sa/si/gr	85	85	sedimentation
Reach 7a	2.5	4.5	<1.0	45	45	10	high	high	mod.	gr/co/sa	90	55	sedimentation
Reach 7b	2.5	4.5	<1.0	40	40	20	high	mod.	absent	sa/si	100	85	sediment./divers.
Liddell (West Branch)													
Reach 10	4.5	6.0	<1.0	15	65	20	mod.	mod.	low	gr/co/sa	30	80	culverts
Reach 11	3.5	7.0	1.5	35	45	20	high	high	low	gr/co/sa	65	85	bank failures
Reach 12	2.5	5.0	1.0	30	50	20	high	high	low	co/gr/sa	60-100	80	sedimentation

[a] Cover availability rated in relative terms: absent, low, moderate (mod.), high.
[b] Size classes: Silt (si), sand (sa), gravel, (gr), cobble (co), boulder (bo), bedrock (br); table lists size classes in order of abundance

TABLE 3.3-1 (Continued)
COAST DAIRIES STREAM REACH CHARACTERISTICS

Stream / Reach #	Average Channel Width (ft.)	Average Channel Depth (in.)	Average Pool Depth (ft.)	Habitat Types			Cover Type & Availability[a]			Substrate Characteristics		Channel Shading (%)	Potential Disturbances
				Pools (%)	Riffles (%)	Runs (%)	Under-cut Banks	Large Woody Debris	Instream Vegeta-tion	Size[b]	Em-bedded-ness (%)		
Yellow Bank													
Reach 1	2.0	3.0	<1.0	50	40	10	mod.	absent	absent	br/sa	100	95	bore
Reach 2	2.0	3.0	<1.0	30	30	40	mod.	mod.	mod.	co/gr/sa	75	85	diversions/dam
Reach 3	3.5	6.5	<1.0	15	50	30	high	mod.	mod.	co/gr/sa	50	75	none observed
Reach 4	4.0	5.5	1.0	20	50	30	high	mod.	mod.	gr/co/sa	35	85	none observed
Reach 5	2.0	11.0	1.5	50	25	25	high	mod.	low	br/co/gr	45	90	channel incision
Reach 6	3.5	5.0	1.0	25	50	25	high	mod.	mod.	co/gr/sa	45	70	road failure
Reach 7	2.5	4.0	1.0	30	50	20	high	high	mod.	co/gr/sa	60	75	bank failures
Reach 8	1.5	2.5	<1.0	50	30	20	high	high	low	co/gr/sa	55	75	road failure
Laguna													
Reach 1	30.0	60.0	8.0	50	0	100	high	absent	low	sa	100	0	sand bar
Reach 2	15.0	12.0	2.0	20	20	60	high	low	low	co/gr/sa	75	30	none observed
Reach 3	5.5	6.5	1.0	20	60	20	mod.	low	low	co/gr/sa	35	50	diversion
Reach 4	6.0	5.5	1.0	15	60	25	mod.	low	low	sa/gr	50	85	none observed
Y (tributary to Laguna)													
Reach 5	5.5	7.0	2.0	45	45	10	high	mod.	low	bo/co/sa	20	85	waterfall
Reach 6	3.0	5.0	1.0	30	40	30	high	mod.	mod.	br/co/gr	30	75	cattle
Reach 7	3.5	4.5	1.0	40	40	20	high	low	mod.	co/br	50	75	cattle
Reach 8	2.0	2.5	<1.0	40	40	20	high	high	low	co/bo/gr	40	85	none observed

[a] Cover availability rated in relative terms: absent, low, moderate (mod.), high.
[b] Size classes: Silt (si), sand (sa), gravel, (gr), cobble (co), boulder (bo), bedrock (br); table lists size classes in order of abundance

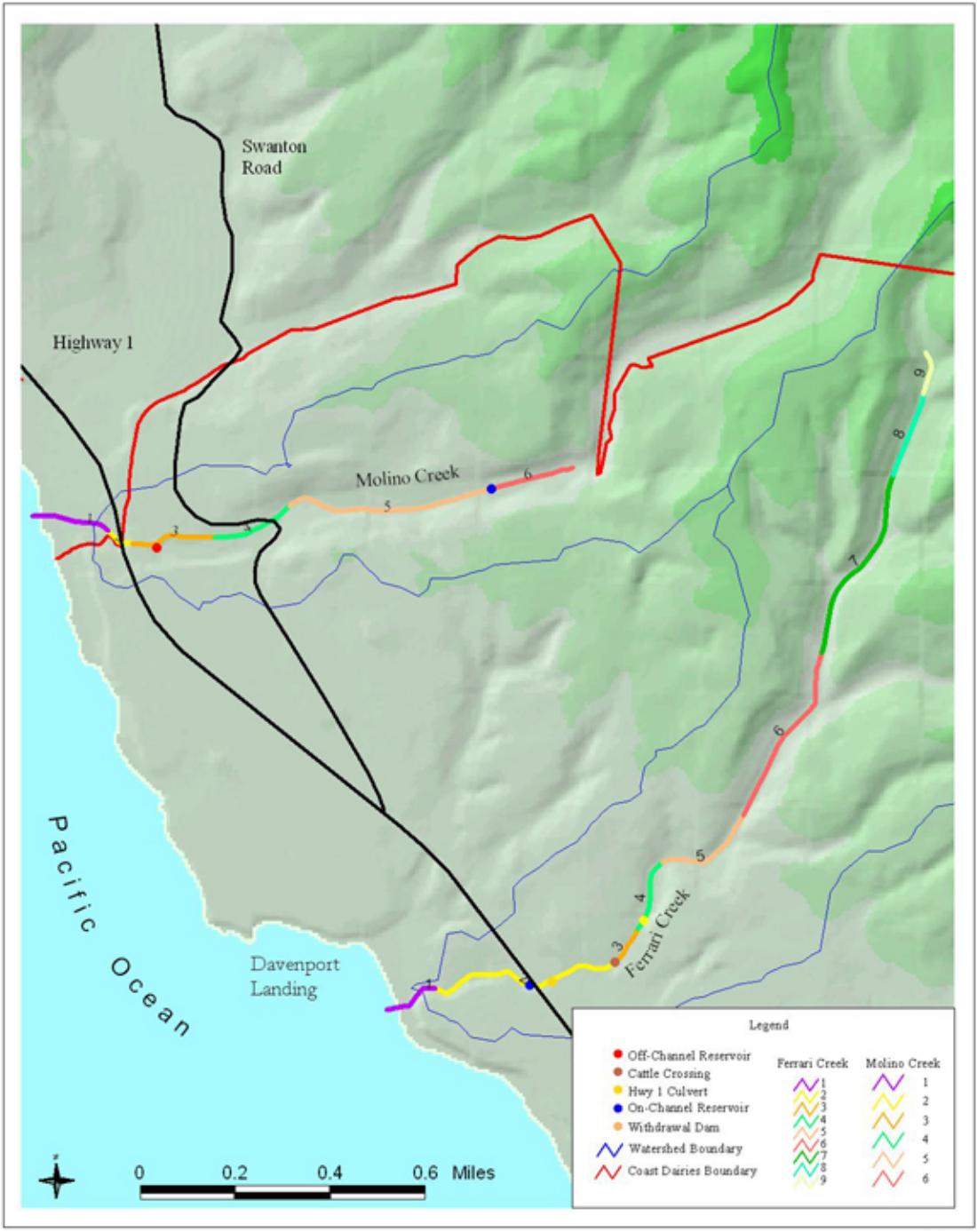
Reach 4) consists of an unscreened 12-inch culvert.[5] Bank undercut has resulted in localized failures in Reach 4. Reach 5 extends up to the foot of an on-channel reservoir, which is currently not being operated due to partial dam failure during the 1999-2000 winter. Even in its current flow-through condition, the reservoir presents a formidable migration barrier since the outlet culvert is located 6 to 7 feet above the downstream channel. Below the reservoir, the reach consists primarily of small riffles with some shallow pools. Although the channel flowing through the currently non-storing reservoir is incorporated into Reach 6, survey results summarized in Table 3.3-1 are based on the portion upstream of the reservoir, which becomes increasingly narrow with dense riparian vegetation of willows and alders. The predominant substrate size class in this reach is cobbles, which provide sub-optimal spawning habitat. The region upstream of Reach 6 was not surveyed due to its inaccessibility.

Although the stream length and watershed size of Molino Creek are relatively small compared to other coastal streams in the region (e.g., Scotts Creek, San Vicente Creek), the stream does provide limited habitat for anadromous salmonids and appears to contain no impassable barriers downstream of potential spawning and rearing sites (Reaches 3 through 5). The primary limiting factor on Molino Creek may be natural – the small watershed area does not appear to produce sufficient storm run-off to maintain optimal water depths throughout the spring, even with the upstream on-channel reservoir being operated as a flow-through system. Below average rainfall during the 2000-2001 wet season, combined with diversions to the off-channel reservoir may have contributed to the low water levels observed in May, 2001 but are not likely to be solely responsible for these conditions.

3.3.4.2 FERRARI CREEK

Ferrari Creek is also located in the northern portion of the Property and enters the ocean at Davenport Landing (Figure 3.3-1a) after flowing through the U.S. Abalone facility. Reach 1, the mouth of the creek, consists of an old concrete flume which was previously used by a fish farm to guide returning adult salmon back into the farm. Although this flume may not meet current hydrologic standards for fish passage, the structure contains baffles and functioned effectively enough to be used by the fish farm in the past and does not appear to present a significant obstacle to salmonids. The downstream portion of Reach 2 is located on the U.S. Abalone lease Property and was not surveyed. However, U.S. Abalone stated that there are no migration barriers located in that section (B. Smith pers. comm., 2000-2001). The abalone farm does use the flume to discharge sea water that has been cycled through their abalone tanks. This saline

[5] The inlet will be screened in the near future (Rosenblatt pers. comm., 2000)



SOURCE: Environmental Science Associates, Pacific Meridian Resources, USGS

Figure 3.3-1a
Stream and Reach Classification
on the Coast Dairies Property

discharge may make it difficult for returning adult salmonids to identify the creek as a freshwater stream.

Upstream of U.S. Abalone, Reach 2 contains a small on-stream reservoir that is currently not used to divert water. Although water is flowing freely through a 4-foot culvert, enough water is retained behind the earthen dam to maintain a small pond. Thirty-five to fifty yearling salmoids were observed in the pond. The culvert appears passable to salmonids during winter upstream migrations but flows may be too low for successful smolt downstream passage during the late spring. Due to a partial dam failure that occurred during the 2000-2001 winter season, the dam is scheduled to be removed in the near future. Reach 2 also includes a far more difficult-to-pass migration barrier at the outlet of the Highway 1 culvert. The outlet creates a 7-foot waterfall into a pool that appears to be too shallow to allow salmonids to jump the fall. However, yearling salmonids were observed both downstream and upstream of Highway 1, suggesting that either the culvert is passable during very specific flow conditions, or that the upstream population consists of landlocked steelhead.

Reach 3 contains a fair amount of spawning gravels and some minor rearing pools. A cattle operation is located along the creek banks, but recent fencing has greatly reduced the amount of stream bank trampling and erosion. Cattle moving from their pastures on the north side of the creek to those on the south side are now confined to a 10-foot wide cattle crossing. Salmonid yearlings were observed in this reach. Reach 4 contains yet another migration barrier in the form of a concrete dam associated with a direct diversion site. The dam creates a 6- to 7-foot vertical drop with a shallow pool below. A culvert runs under the dam but appears to be either closed or non-functional. Nevertheless, over 50 juvenile salmonids were observed upstream of this barrier, suggesting a landlocked population. Reaches 4 through 8 are generally similar, contained within a fairly narrow channel consisting primarily of riffle habitats. Riparian vegetation becomes increasingly dense. Although isolated bank failures were observed in most reaches, erosion and sedimentation do not appear excessive. Reach 9 constitutes the headwaters of Ferrari Creek and was beginning to dry up at the time of the surveys.

With respect to the geomorphologic and biotic conditions of the stream, Ferrari Creek appears to provide adequate habitat for a small salmonid population. Clearly the primarily limiting factor on this creek is the presence of difficult-to-pass and/or impassable migration barriers located below Reach 5. As is the case with Molino Creek, the small watershed size of Ferrari Creek may also limit water availability.

3.3.4.3 SAN VICENTE CREEK

San Vicente Creek flows through the town of Davenport on its way to the ocean (Figure 3.3-1b). Reach 1 consists of the mouth of the creek flowing across the beach. Reach 2 includes the railroad crossing (an artificial bore through bedrock), the Highway 1 crossing (a box culvert) and the short, open stretch between the two. While detailed hydrological studies are required to determine the ease with which salmonids can migrate through the two crossings (Whitman pers. comm., 2001), they do appear passable during at least parts of the migration season. Tidal action

extends approximately half way into the railroad bore. Reach 3 is relatively wide and consists primarily of riffles with a few pools approximately 2 to 3 feet deep. Slack water habitat for young-of-the-year salmonids is abundant and between 500 and 700 recently emerged steelhead were observed. Yearlings-and-older salmonids were also observed in some pools. An off-channel reservoir located in Reach 3 contained about 500 young-of-the-year steelhead and has been identified by previous researchers as excellent rearing habitat (Harvey & Stanley Associates, 1982; McGinnis, 1991). However, while small fish can easily enter this pond, escapement of smolts is not as certain. The inlet and outlet should be assessed further and if necessary should be reconstructed to either allow passage for all salmonid life stages, or screened to prevent fish access entirely.

Reach 4 has similar channel dimensions, habitat diversity, and substrate composition as Reach 3, although riparian shading in this section amounts to only about 50 percent. Young-of-the-year and yearlings were observed throughout. This reach also contains an off-channel reservoir. However, no fish were observed in this pond, suggesting that the inlet and outlet are sufficiently screened or that passage into and out of the area are unimpeded. The reach offers good salmonid habitat, including several deep pools associated with spider log structures installed with CDFG funding during a 1999 restoration project. In the fall of 1999 a large adult steelhead was observed in a pool under a bridge in the upstream portion of the reach. Several smolts were seen in the same location in the spring of 2001. Reach 5 continues with similar channel dimensions as the previous two reaches, but the vegetation quickly transitions from a deciduous riparian zone to mixed evergreens, primarily redwoods. Riffles and runs dominate the reach, with significant pools being fairly sparse (again, most significant pools are associated with CDFG restoration structures). Isolated bank failures have occurred adjacent to the access road running alongside the channel. The average width of Reach 6 is somewhat narrower than previous reaches, but substrate and embeddedness (50-60 percent) characteristics are similar. The reach also contains further bank failures associated with the access road.

SOURCE: Environmental Science Associates, Pacific Meridian Resources, USGS

Figure 3.3-1b
Stream and Reach Classification
on the Coast Dairies Property

San Vicente Creek appears to be a relatively productive steelhead stream providing adequate spawning and rearing habitat for the species. However, a general lack of deep pools, which provide important coho rearing habitat as well as summer thermal refugia, was noted during the stream surveys and by previous researchers (McGinnis, 1991; CDFG, 1996). As mentioned above, CDFG has funded recent efforts to increase both woody cover features and pool availability. The total stream length available to salmonids has also been significantly increased through the removal of a concrete dam identified by McGinnis (1991). Further aspects of the stream that may create sub-optimal salmonid conditions are the generally high levels of sand and silt, and potentially high stream temperatures due to limited channel shading, particularly in the lower reaches. The source of sedimentation was not identified, but old quarries located upstream of the Coast Dairies Property may contribute to the observed conditions.

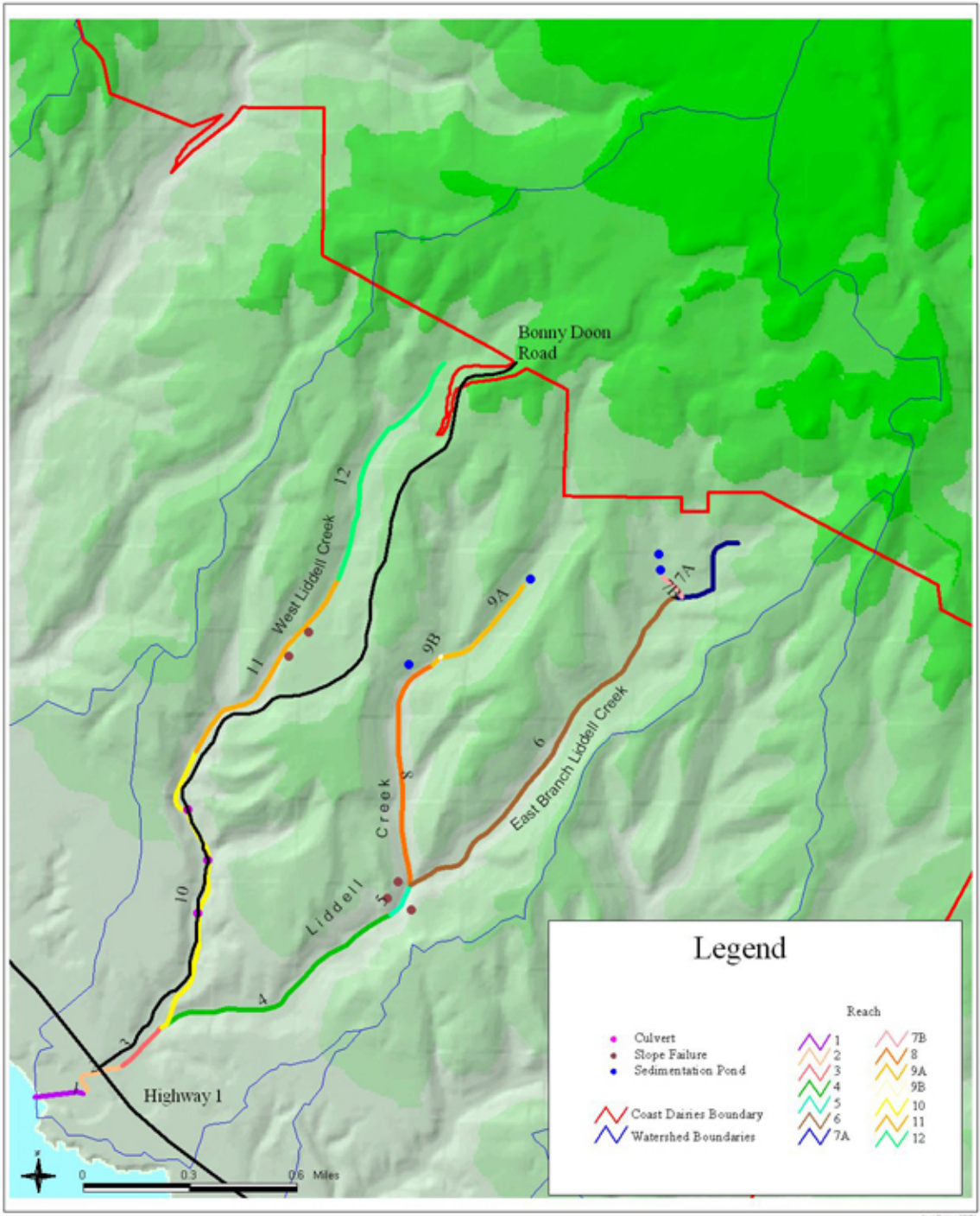
3.3.4.4 LIDDELL CREEK

Liddell Creek is located south of Davenport and enters the ocean via Bonny Doon Beach and consists of three distinct forks, the main, east, and west branches (Figure 3.3-1c). The branches are discussed separately below.

Main (Middle) Branch

Reach 1 forms the mouth of the creek across Bonny Doon Beach. Reach 2 consists of a bedrock bore (reinforced with concrete) passing under both Highway 1 and the railroad tracks. The outfall of the tunnel contains two concrete barriers partially closing the opening, presumably to prevent sand build-up inside the bore. This crossing appears to be marginally passable to migrating salmonids during certain hydrologic conditions. During the time of the surveys, the outfall and the creek bed across the beach were at approximately the same elevation, but at times when the ocean scours away sand from the beach, a vertical drop of up to 3 feet with no significant plunge pool forms at this location. This condition was observed during the 1999-2000 winter. RMC Pacific Materials and CDFG have been coordinating an effort to improve passage through the bore with the installation of baffles and a small fish ladder (Anderson pers. comm., 2000-2001). Construction for this project is likely to occur during 2001.

Reaches 3 and 4 are fairly wide and contain some minor pools. Sedimentation and minor bank failures are evident throughout the two reaches, which also contained about 50 yearling salmonids. Reach 5 also contained some yearlings and one young-of-the-year. Sedimentation is more pronounced in this reach. Road and bank failures are partially responsible for the relatively high levels of fine sediments, but the fact that the levels of sedimentation and embeddedness continue to increase throughout the upstream reaches (Table 3.3-1) suggest that quarry operations located in the headwaters are at least partially responsible for this condition. Reach 8 (Reaches 6 and 7 are located on the East Branch discussed below) becomes increasingly narrow and shallow, but several yearling salmonids were observed here as well. Reach 9A forms the outfalls of two sedimentation ponds operated by RMC Pacific Materials. The outlet of one pond via a 3-foot



SOURCE: Environmental Science Associates, Pacific Meridian Resources, USGS

Figure 3.3-1c
Stream and Reach Classification
on the Coast Dairies Property

concrete culvert contained very little suspended solids (i.e., silt), but the water exiting the other culvert from a pond spillway carried large amounts of sediments. Embeddedness here is almost 100 percent and both the water and substrate contain a deep orange "ferric" color. Reach 9B is assumed to be the natural course of the creek but contained too little water for detailed characterization. However, evidence of sedimentation and embeddedness in this reach are considerably lower than those observed in Reach 9A.

East Branch

Reach 6 forms the confluence of the East Branch and the Main Branch. Again, this reach contains large amounts of fine sediments and an average embeddedness of 85 percent. Only a few yearling salmonids were observed in the lower portion of this reach. Access to the upstream portion of this reach may be impossible due to the presence of a logjam waterfall. Reach 7A appears to be the natural upstream continuation of this branch. A recent sediment flow appears to have come down the adjacent slope, depositing large amounts of sediments in the creek bed. Reach 7B forms the outfall channel connecting two quarry-related sedimentation ponds to the channel. During the week of February 26 to March 2, 2001 the lower of the two ponds failed (B. Smith pers. comm., 2000-2001). A rupture in the bottom/horizontal pipe caused accumulated sediments to drain out of the pond and into the creek, entirely covering the channel bed of Reach 7B. The sediment flow observed in Reach 7A also originated from the sedimentation ponds, and may have been a result of the ponds overflowing.

West Branch

Reach 10 forms the confluence of the West Branch with the Main Branch. This reach contains far less fine sediments than any reach located on the Main and East branches. The substrate consists primarily of gravel and cobble and provides adequate spawning habitat. Several yearling salmonids were observed in this section. The reach passes under Bonny Doon Road via culverts in three separate locations. The Santa Cruz County Department of Public Works is currently evaluating ways of repairing/upgrading two of the three culverts and CDFG is working closely with the Department to assure the new culverts meet current NMFS/CDFG standards (NMFS, 2000). However, the upstream-most culvert is currently not being addressed although it appears to present a significant migration barrier as well as threatening the integrity of the road (Whitman pers. comm., 2000-2001).

While Reach 10 is a gently sloped, low gradient reach, the West Branch of Liddell Creek becomes increasingly steep in Reach 11. This section contains many cascades and plunge pools. Two significant slope failures have occurred in this reach during recent years (Figure 3.3-1c), and may contribute to the high levels of sedimentation in this area. Some small salmonids were observed in the reach, but a 7-foot logjam with only a shallow plunge pool appears to present an impassable barrier to fish; none were observed upstream of this site. Reach 12 is similar to Reach 11. However, while the lower portion of the reach has an average embeddedness of about 60 percent, the upper portion contains abundant sediments and 100 percent embeddedness immediately downstream of the conveyor belt crossing. Access roads associated with the quarry

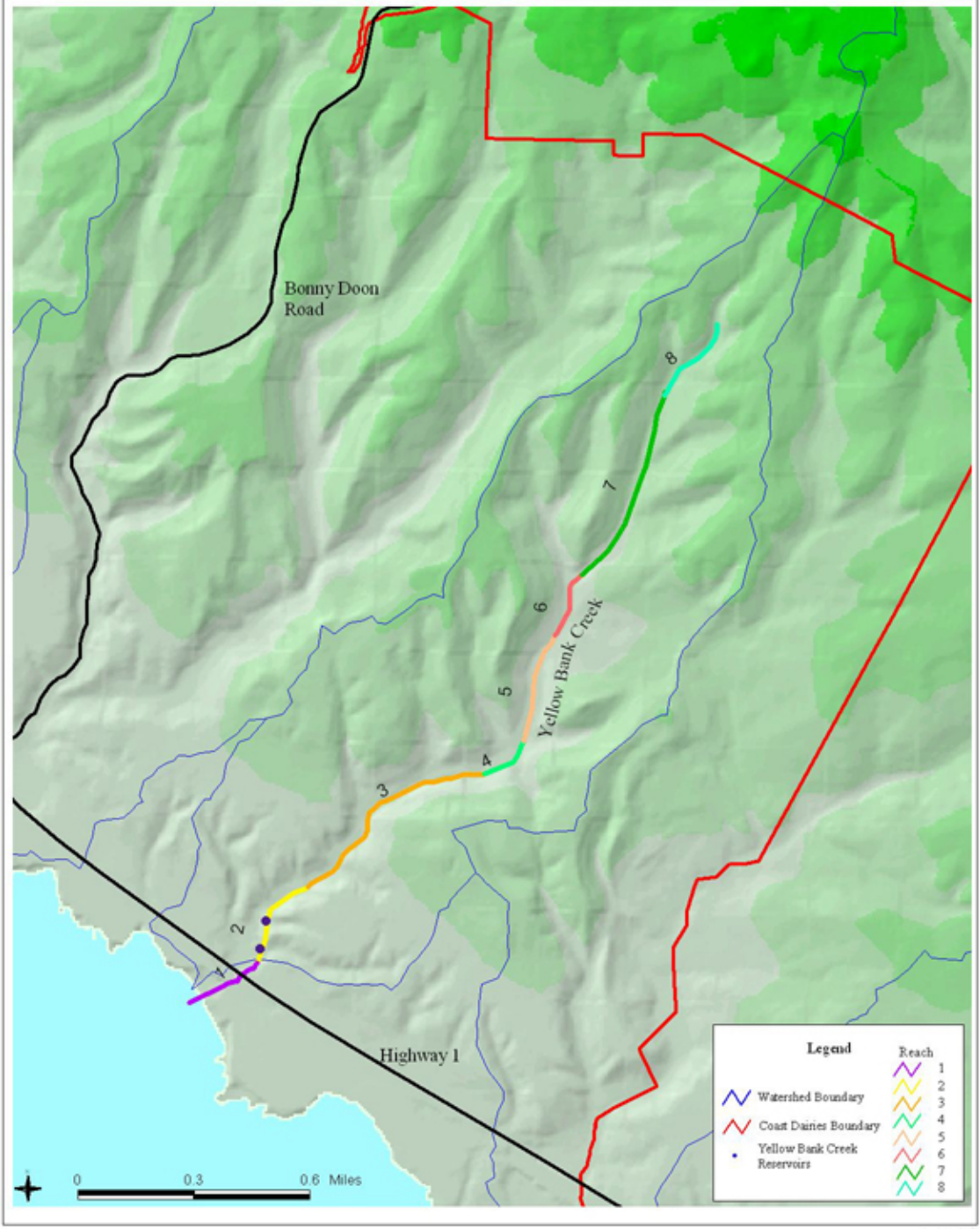
operations in this area are very loose and drainage ditches are directed toward the channel. This results in a high degree of sediment input to the channel during storm events. Furthermore, mounds of fine materials spilling from the conveyor belt have accumulated next to the channel and are contributing to sedimentation in the creek. Two adjacent culverts, delivering water through the conveyor belt fill berm, are located in this reach. One culvert originates at a sedimentation pond while another one constitutes the upstream continuation of Reach 12. The latter culvert in particular has eroded significant amounts of fill material from the side of the berm. The culvert appears to be entirely impassable to salmonids.

As discussed above, all three branches of Liddell Creek are exposed to severe sedimentation, which appears to be the primary limiting factor in this watershed, although the dense canopy cover has also been shown to limit primary production, and thus food supplies for fish, in this system (McGinnis, 1991). While dense canopy cover is a natural condition, the input of fine sediments undoubtedly reduces available spawning habitat and should be addressed. A detailed study of the quarry operations that evaluates options for improving sediment containment should be a high priority for this watershed.

Another significant limiting factor appears to be the unlimited water rights the City of Santa Cruz holds for Liddell Springs #1 and #2. Withdrawals from Liddell Spring #1, located in the East Branch headwaters just upstream of the Property boundary, have been identified as particularly detrimental to summer and fall flows in that branch (McGinnis, 1991). CDFG is currently pursuing legal avenues to limit these withdrawals (Anderson pers. comm., 2000-2001).

3.3.4.5 YELLOW BANK CREEK

Yellow Bank Creek is located south of Davenport between the Liddell Creek and Laguna Creek watersheds (Figure 3.3-1d). Reach 1 forms the mouth of the creek. At the time of the surveys, there was no surface water connection to the ocean. This reach also includes two bore tunnels under the railroad tracks and Highway 1, as well as an open portion between the two. At the location where the creek exits the downstream bore onto the beach, a 3-foot drop with a very shallow plunge pool may present a migration barrier during parts of the year. Reach 2 contains two on-channel reservoirs and a cattle enclosure between the two. The outlets of both reservoirs were submerged at the time of the surveys, but both appeared to present impassable barriers. Upstream of the second reservoir, Reaches 3 and 4 are undisturbed, natural stream reaches that provide both spawning and rearing habitat for salmonids. Reach 4 actually contained salmonids, presumably landlocked steelhead. Reach 6 is very narrow and undergoing active incision. The channel bed is currently located 6 to 8 feet below the floodplain. Nevertheless, salmonids were observed in this reach as well. A road failure located in this reach is contributing significant amounts of fine sediments to the stream. Further signs of active incision were observed in Reach 7, which contained no fish. Several road failures are present in Reach 8, which contains large amounts of sediment (presumably from the failures) as well as further evidence of channel incision.



SOURCE: Environmental Science Associates, Pacific Meridian Resources, USGS

Figure 3.3-1d
Stream and Reach Classification on the Coast Dairies Property

The primary limiting factor in this watershed is the presence of the two reservoirs in Reach 2, which appear to be impassable. Upstream of the reservoirs, the watershed provides adequate spawning and rearing habitat. Removal of these barriers, combined with stabilization of the road and channel banks in the upper watershed, would almost certainly make Yellow Bank Creek a productive steelhead stream.

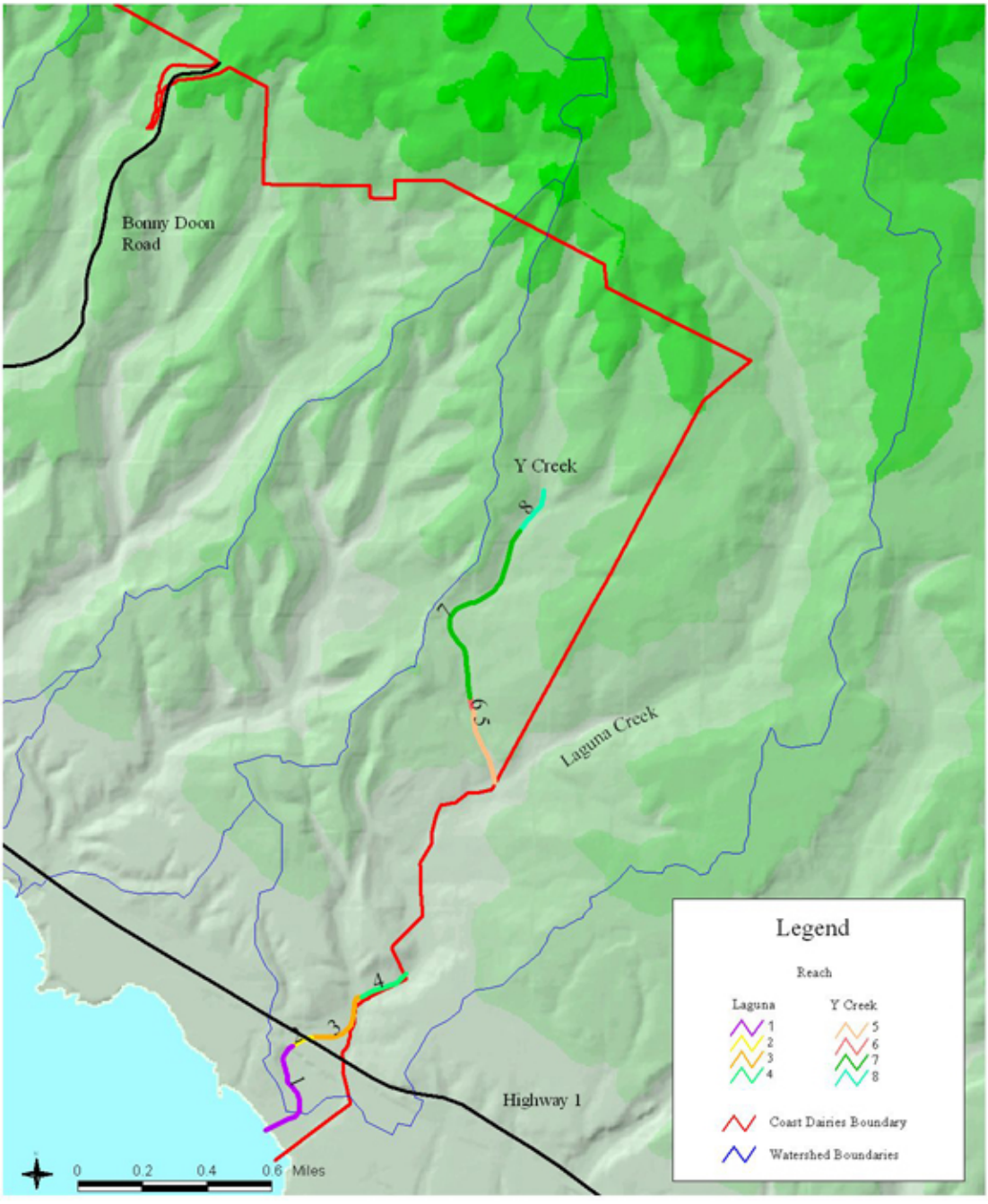
3.3.4.6 LAGUNA CREEK

Laguna Creek is located along the southern boundary of the Coast Dairies Property line and empties into the Pacific Ocean at Laguna Beach (Figure 3.3-1e). Reach 1 meanders through Laguna Creek Marsh, but a sandbar prevented the creek from flowing into the ocean at the time of the surveys. The lagoon present behind the sandbar provides habitat for salmonid smolts acclimatizing to ocean conditions prior to entering the ocean (when the sandbar is open). Reach 2 includes the culvert beneath Highway 1, which does not appear to present a migration barrier. This reach provides very good rearing habitat within a relatively deep channel containing an abundance of undercut banks. No significant disturbances were noted in this reach. Reach 3 is considerably narrower and shallower than the previous section, but provides potential spawning habitat. Reach 4 is similar to Reach 3, but contains a larger degree of fine substrate materials. The upstream end of Reach 4 forms the confluence with Y Creek (discussed below) and also represents the upstream extent of the part of the Laguna Creek located within the Coast Dairies boundary. Approximately 20 yearling salmonids were observed in this reach.

No significant limiting factors were identified in the surveyed downstream portion of Laguna Creek. However, the City of Santa Cruz operates a diversion site permitted for unrestricted withdrawals upstream of the Property. According to CDFG, the City diverts close to 100 percent of the headwater flows from Laguna Creek (Anderson pers. comm., 2000-2001) and the source of water flows observed on the Coast Dairies Property is believed to be entirely from tributaries such as Y Creek. As is the case with the Liddell Creek diversions, CDFG is attempting to reduce the City's diversion rates to allow some of the water to remain in the creek.

3.3.4.7 Y CREEK

Y Creek is a tributary to Laguna Creek and, in terms of reach enumeration, forms the continuation of Laguna Creek. Thus, Reach 5 includes the confluence of Y and Laguna creeks. At the confluence, a large boulder waterfall appears to present a formidable barrier to salmonid migration. Beyond the fall, the channel gradient is extremely steep. Nevertheless, close to 30 young-of-the-year and yearling salmonids were observed in this reach. The gradient of Reach 6 is considerably lower than the previous section and provides adequate salmonid habitat with a fairly even mix of riffles, pools, and runs. However, no fish were observed in this area. Largely uncontrolled cattle grazing occurs on both sides of the creek. Reach 7 is similar to Reach 6 but contains increasing amounts of boulders and bedrock. Cattle, but no fish, were observed in the channel. Reach 8 becomes increasingly narrow and contains evidence of active incision, as well as past redwood logging. Again, cattle have access to this reach, but no fish were observed.



SOURCE: Environmental Science Associates, Pacific Meridian Resources

Figure 3.3-1e
Stream and Reach Classification
on the Coast Dairies Property

Y Creek is a relatively steep stream characterized by an abundance of cascades, boulders, and bedrock. Although there appears to be adequate habitat for a small steelhead population, all fish observations occurred near the creek's confluence with Laguna Creek. No significant limiting factors were identified, although exclusionary fencing for cattle, which has already been started along parts of the stream, should be completed.

3.3.5 INSTREAM FLOW REQUIREMENTS

Water withdrawals from streams have been identified by several researchers and agency personnel as a major limiting factor for fisheries resources throughout the Coast Dairies Property (Anderson pers. comm., 2000-2001; Harvey & Stanley Associates, 1982; Creegan & D'Angelo, 1984; McGinnis, 1991; CDFG, 1996). Instream flow requirements, also known as bypass flows or minimum flow requirements, are estimates of the amount of stream flow, measured in cubic feet per second (cfs), that is required to prevent the loss of aquatic life or habitat in a creek. The SWRCB, in consultation with CDFG and NMFS, typically sets instream flow requirements for water rights negotiations. These requirements establish a certain stream flow below which no water diversions are permitted. In streams that are capable of supporting anadromous salmonids, bypass flows are most commonly based on the amount of water thought to be necessary for fish to migrate through the stream during winter and spring months. In order to maintain sufficient over-summering habitat such as pools and thermal refugia, diversions during summer and fall are usually not permitted.

As discussed in the Methodology section above, the median February flow method used to derive preliminary instream flow requirements for the Coast Dairies creeks is still undergoing development by NMFS and has not been adapted to streams south of San Francisco[6]. Furthermore, the bypass flows established under this new methodology are typically applied to a permitted diversion period of December 15 to March 31. Proposed withdrawals outside this period are usually not permitted (SWRCB, 2001). Since most agricultural diversions on the Coast Dairies Property are believed to occur during the summer growing season, compliance with this restriction would require additional construction of off-channel reservoirs. Future water rights negotiations should be based on the most current version of the NMFS methodology (when adapted to central California streams) or should employ site-specific field surveys, such as a critical riffle passage methodology (HRG, 1997) below the proposed point of any diversion.

The results of the instream flow requirement calculations (Table 3.3-2) show the streams being separated into two clear categories. The two larger streams on the Coast Dairies Property, San Vicente and Laguna Creek, both appear to require between 13 and 20 cubic feet per second (cfs) of flow to provide sufficient migratory and spawning habitat, while all the other creeks require less than 3 cfs.

[6] NMFS is considering the use of the March median flow for determining bypass flows on creeks south of San Francisco Bay (Hearn, pers. comm.)

The larger size of San Vicente Creek and Laguna creeks also allow for greater cumulative diversion rates (approximately 6 to 8 cfs), while acceptable withdrawal rates on the other creeks are all below 1.5 cfs. In comparison, the CDFG set the instream flow requirements of Scotts Creek, which has a watershed area of about 27 square miles, at 40 cfs during the winter and early spring and at 6 cfs during the summer and fall. The CDFG did not address diversion rates (Snider et al., 1995).

TABLE 3.3-2
ESTIMATED INSTREAM FLOW REQUIREMENTS AND MAXIMUM CUMULATIVE INSTANTANEOUS DIVERSION RATES FOR COAST DAIRIES STREAMS

Creek	Approximate Watershed Area (sq. miles)[a]	Estimated Instream Flow Requirement (cfs)[b]	20% Winter Exceedence Flow (cfs)[c]	Maximum Cumulative Instantaneous Diversion Rate (cfs)[d]
Molino	1.5	2.1	5.5	1.1
Ferrari	1.3	1.8	4.5	0.9
San Vicente (downstream)	10.5	19.4	40.5	8.1
San Vicente (upstream)	9.9	18.1	38.0	7.6
Liddell (main branch)	1.9	2.8	7.0	1.4
Liddell (west branch)	1.3	1.8	4.5	0.9
Yellow Bank	0.6	0.7	2.0	0.4
Laguna	7.6	13.4	29.0	5.8
Y (tributary to Laguna)	0.8	1.0	3.0	0.6

Notes (see Section 3.3.2 *Methodology* for further explanation):
a. Based on watershed area upstream of water quality/hydrology sampling stations.
b. Based on estimated median February flow.
c. Flow level that is met or exceeded on 20% of the winter days (December 15 through March 31)
d. Based on 20% of the "20% winter exceedance flow".

3.3.6 ISSUES

Various issues regarding the fisheries resources were identified during the literature review and field surveys conducted for this existing Conditions Report. Some of the issues, such as water diversions and migration barriers, are deemed limiting factors to anadromous salmonids. Removing or improving these adverse conditions should be considered a high priority for future land managers. San Vicente Creek, where severely endangered coho salmon are known to occur, should be considered a unique biological resource, and carefully protected and restored. All of the streams on the Property are included in the Critical Habitat designations for both steelhead and coho, and should be managed as anadromous salmonid streams. Addressing other issues,

such as riparian fencing and revegetation, and increasing the frequency and quality of pools, would add to the overall improvement of aquatic habitat conditions on the Coast Dairies Property.

3.3.6.1 WATER DIVERSIONS AND MIGRATION BARRIERS

Water diversion and migration barriers are discussed together since they are typically closely associated with each other, especially in situations of on-channel water storage facilities. While we recognize the importance of agriculture to the region in general and to the livelihood of the Coast Dairies farmers in particular, water diversions and migration barriers should be addressed in order to restore viable steelhead populations in all streams and coho salmon in San Vicente Creek. The most effective means of removing the permanent barriers on the Property, while maintaining the viability of irrigated agriculture on the Property, is through the replacement of the existing on-channel reservoirs and dams with off-channel storage facilities. Filling the off-channel reservoirs in a regulated manner during high flow winter periods (December 15 through March 31) and storing the water until it is needed during the summer would significantly increase the availability of summer rearing habitat for salmonids.

During field inspections in May, 2001 TPL staff and CDFG staff inspected the three off-channel reservoirs on San Vicente Creek. CDFG staff expressed their opinion that the two functioning reservoirs both pose hazards to anadromous fish. The lower reservoir, immediately upstream of Highway 1, may trap juvenile fish, as was noted in the description of San Vicente stream reaches earlier in this chapter. In addition, local residents have apparently been stocking this reservoir for many years with fish species that have not yet been determined. The stocked fish may prey on juvenile salmonids present in the reservoir. In addition, fishing in this reservoir likely results in the take of salmonid juveniles.

A second off-stream reservoir on San Vicente Creek is not currently functional and, in the opinion of CDFG staff, poses few problems for the fishery. A third reservoir, however, occupies part of the active stream channel, and was apparently built in a natural stream meander. This reservoir also was observed to harbor juvenile salmonids. Concerns with this reservoir include the possibility that it traps fish; and the high danger of damage during high winter flows, due to the fact that it is placed within the active stream channel.

CDFG, Santa Cruz County, and the previous owners of the Property have contemplated the issue of improving off-channel water storage in the past (B. Smith pers. comm., 2000-2001). Under this plan, several storage facilities would have been constructed on the coastal terrace located northeast of Swanton Road and south of Molino Creek. The water supply would then be presumed to come from winter flows diverted from Scotts Creek and Molino Creek. This plan never came to fruition, due in large part to the limited water availability from Scotts Creek. Revival of this plan should perhaps be considered. Water for the reservoirs should come from Coast Dairies streams only. Water budgets for the Coast Dairies streams should be combined with future minimum flow requirement assessments to determine the environmental and economic feasibility of off-channel reservoirs, and the amounts of water that would be available for agricultural use. Another water management method that has been contemplated in the past is

the use of infiltration galleries to recharge groundwater during wet winter months, for withdrawal during the summer.

In addition to developing additional or alternative supplies of water on the Property, conservation of this resource should be a prominent feature of the Long-Term Resource Protection and Use Plan. The Long-term Resource Protection and Use Plan (Plan) should investigate and evaluate possible changes in farming practices, such as crop selection, cultivation practices, and the extent of irrigated fields on the Property in order to minimize the need for water withdrawals (see Section 5.2).

While the majority of diversions on the Coast Dairies Property are for agriculture, potentially more significant are the municipal water withdrawals located upstream of the boundary. The City of Santa Cruz has unlimited water rights for two diversion sites on Liddell Creek and one site on Laguna Creek. These diversions have been shown to significantly reduce summer and fall flows in these creeks. The CDFG is currently attempting to reduce the diversion rates at these sites in order to protect threatened steelhead and other aquatic species (Anderson pers. comm., 2000-2001).

3.3.6.2 DIVERSION SCREENING

The issue of diversion screening is closely related to the issues discussed above. Screening criteria have been established by NMFS (1997). Direct withdrawal sites need to be screened with a sufficiently small mesh size (3/32 inch) to prevent fish and amphibians from being entrained (sucked into the pumps). The screening design also needs to take sweeping velocity (water velocity running parallel to the screen) and approaching velocity (water velocity running perpendicular to the screen) into account in order to prevent impingement (aquatic organisms being pinned to the screen by the suction force of the pumps). In the case of the existing off-channel reservoirs, CDFG favors screening of the inlet/outlet of the reservoirs (B. Smith pers. comm., 2000-2001), thus excluding salmonids from these ponds and preventing them from getting trapped. The Plan should include careful investigations of all diversion systems and recommendations as to their improvement.

3.3.6.3 SEDIMENT MANAGEMENT

While some degree of sedimentation (the deposition of fine sediments such as sand and silt on the channel bed) is evident on most streams on the Coast Dairies Property, the Liddell Creek watershed contains the most significant amount of fine sediments and high degrees of embeddedness. Although the extent of sedimentation observed in the watershed during April/May 2001 may have been abnormally high due to the accidental failure of sedimentation ponds operated by RMC Pacific Materials in the headwaters, extensive evidence of sedimentation problems had been observed prior to the pond failure. However, the high level of erodibility of Coast Dairies soils in general, and of soils in the Liddell Creek watershed in particular, is doubtlessly an important source of erosion and consequent sedimentation in the streams. Nevertheless, all of RMC's quarry operations should be evaluated by an outside geotechnical

expert and brought into line with current Best Management Practices (BMP) for this type of mining.

3.3.6.4 FENCING

Since TPL began its interim ownership of the Coast Dairies Property, several stream reaches have been fenced to exclude cattle from the channel. Examples of the exclusionary fencing can be found on Ferrari and Y creeks. However, cattle and/or fresh cattle evidence was still observed within or very close to unfenced channel reaches during the April/May stream reconnaissance surveys. Areas of San Vicente Creek and Liddell Creek are still accessible to livestock and should be fenced in the near future.

3.3.6.5 DATA GAPS

Summer Stream Temperatures

One of the most important habitat features for salmonids is the availability of cool stream temperatures. Coho salmon in particular are susceptible to water temperatures exceeding 16.5º Celsius, while steelhead are tolerant of maximum temperatures of 20.5º Celsius (Sullivan et al., 2000). Water temperatures in coastal streams of central California are typically sufficiently low during the winter and spring spawning migration period, but elevated summer temperatures during are more likely to reach stressful or detrimental levels for rearing juveniles. In order to determine average and maximum summer water temperatures, we have installed continuous temperature recorders for the 2001 summer season.

Stream Crossing/Passage Evaluation

As is evident throughout the discussion of the stream reaches, determining whether a given culvert or bore is passable to salmonids cannot be done visually with any degree of certainty. The NMFS and CDFG have jointly developed criteria for designing stream crossings to allow for adequate passage (NMFS, 2000). The same criteria guidelines, involving a detailed hydrologic analysis, can be used to determine to what extent existing crossings are passable to salmonids. All questionable stream crossings on the Coast Dairies Property should be studied using these criteria to determine the upstream extent of habitat available to steelhead and coho salmon. This is particularly important in cases where future restoration efforts may be planned upstream of such crossings. If a given culvert proved to be impassable, any upstream restoration would naturally be superfluous. The locations and types of potential migration barriers are discussed in Section 3.3.4 *Stream Reach Information* and are summarized in Table 3.3-1.

Another issue related to salmonid passage is the saltwater effluent that is discharged by U.S. Abalone via the concrete flume at the mouth of Ferrari Creek. While the discharge is believed to be uncontaminated (pure ocean water is only cycled through the abalone holding tanks), it is currently unclear whether the discharge is saline enough to prevent adults salmonids returning from the ocean from recognizing Ferrari Creek as a freshwater stream. Salinity levels in the

flume should be monitored during the next migration season to determine whether the effluent merely creates brackish water conditions (which would presumably not interfere with salmonid migration) or if salt concentrations are close to ocean levels (which may interfere with migration).

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SECTION 4.0

PHYSICAL RESOURCES OF THE COAST DAIRIES PROPERTY

4.1 HYDROLOGY

There are six perennial streams on the Cost Dairies Property: Molino Creek, Ferrari Creek, San Vicente Creek, Liddell Creek, Yellow Bank Creek, and Laguna Creek. Several of these streams have their watershed entirely or almost entirely on the Property. The larger streams, Laguna Creek and San Vicente Creek, however, have watershed areas that extend well beyond the Property Boundary. As part of the Existing Conditions studies, the Planning Team investigated the hydrology of the region, the Property, and in particular these six streams. The objectives of this hydrologic assessment were to determine the physical characteristics of each stream and its watershed; the general condition of each stream and its watershed; the sensitivity of each of the six watersheds to disturbance; and the natural and human-induced disturbance conditions within each watershed that indicate the stream's suitability for salmonids.

4.1.1 REGIONAL SETTING

This section presents data on the hydrology of the Davenport region, with particular emphasis on regional precipitation and topographic features that affect the Property's hydrology.

4.1.1.1 REGIONAL HYDROLOGY

The Santa Cruz Mountains, like most of central California, are marked by winter rains and summer drought. The streams on the west side of the Santa Cruz Mountains drain relatively small watersheds. The largest, the Pescadero-Butano watershed several miles north of Coast Dairies, has a watershed of about 80 square miles; the largest of the Coast Dairies watersheds, San Vicente, has an area of just under 12 square miles. Most of the streams draining the west side of the Santa Cruz Mountains flow through steep-walled canyons to the Pacific Ocean. These streams tend to exhibit "flashy" (rapidly rising and falling) winter flows in response to storm events, which themselves are intensified by the orographic effect of the mountains. As the dry season progresses and the soil dries out, the streams continue to be fed by seeps and springs. Summer "base" flow at any point in a stream is therefore reflective of the cumulative rate of emergence of groundwater into the stream channel.

4.1.1.2 PRECIPITATION DATA

Figure 4.1-1 shows elevations for the area around Coast Dairies. The Coast Dairies property spans an area with a range of mean annual precipitation from about 25 inches near the coast to about 40 inches at the inland property line. The mean annual precipitation of the upper portions of San Vicente and Laguna Creek is about 50 inches per year.

A rain gauge was operated in Davenport from September 1960 to June of 1977. The average water-year precipitation was 26.27 inches for the period (National Climate Data Center, 1995). A rain gauge near Santa Cruz has been operating since 1905. Its average water-year precipitation, for the 1961-1977 period, was 28.59 inches. The following regression equation predicts the total water year precipitation in Davenport given the Santa Cruz precipitation:

Davenport Water-Year Precipitation = 0.9109(Santa Cruz Precipitation) + 0.2283

The relationship had an $R^2 = 0.9564$, which indicates that the annual precipitation in Santa Cruz explains about 95 percent of the variation in the annual precipitation at Davenport.

The upstream migration and spawning of salmonids, and the large flood events that change the form of stream channels, both occur in late fall through early spring. Therefore, rainfall during the months of December, January, February, and March have the greatest effect on salmonid migration and spawning. The following regression equation predicts the December through March precipitation in Davenport given the Santa Cruz precipitation for the same period:

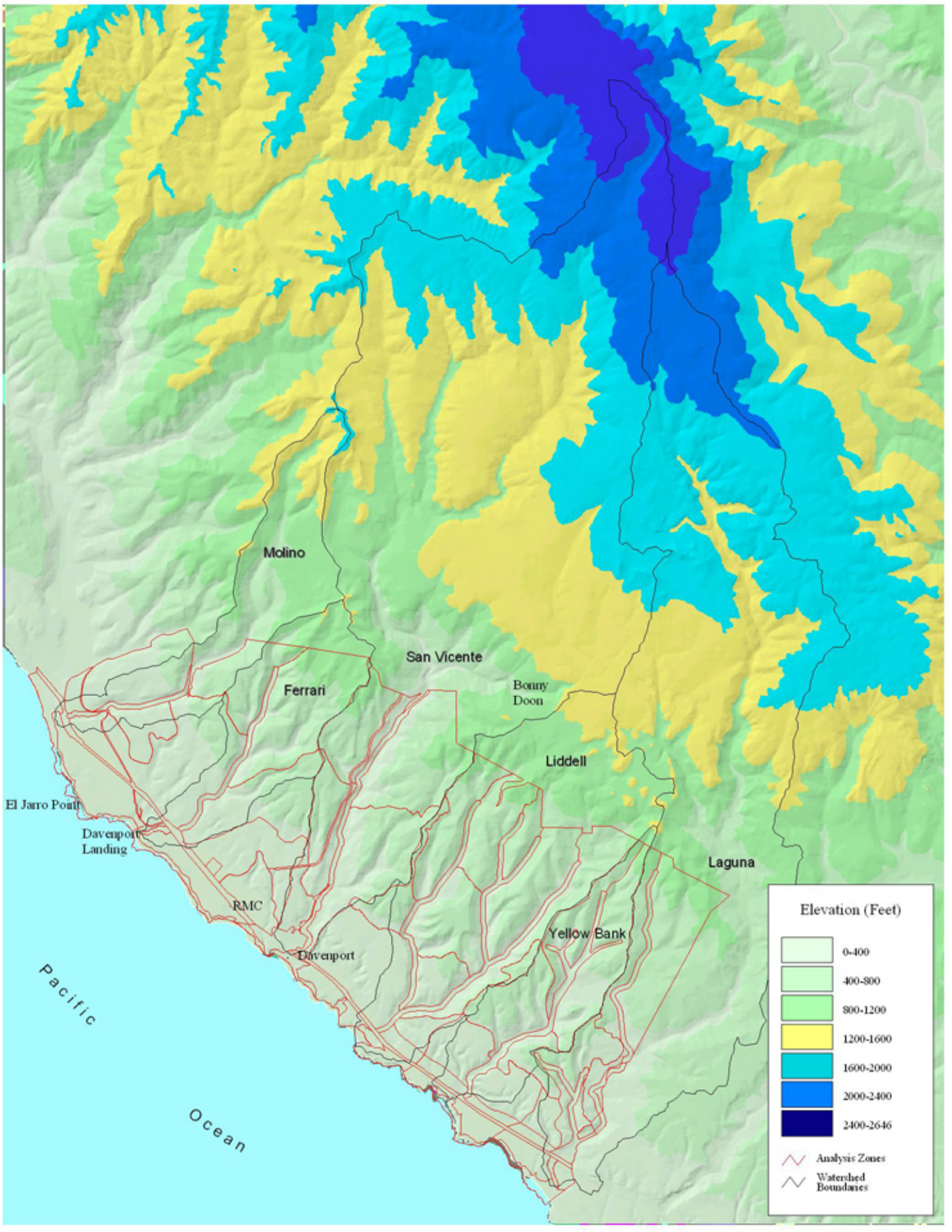
Davenport December-March Precipitation = 0.9046(Santa Cruz Precipitation) - 0.2838

The relationship had an $R^2 = 0.9538$, which indicates that the December-March precipitation in Santa Cruz explains about 95 percent of the variation in the December-March precipitation at Davenport. Figure 4.2-2 shows the December through March precipitation for Santa Cruz, the observed Davenport winter precipitation, and the estimated Davenport winter precipitation for the period 1905-2000. The average winter precipitation at Santa Cruz was 21.67 inches for the period 1905 to 2000. The estimated average winter precipitation for Davenport is 19.32 inches per year for the same period.

Over the period 1905-2000, February has had more rainfall than any other month. Figure 4.2-3 shows the total rainfall at Santa Cruz for each February from 1905 to 2000. The figure shows that the wettest February on record occurred in 1998.[1]

Other precipitation records for the region are also available, but were not used in this assessment. These stations include two rain gauges in Felton, a series of gauges near Ben Lomond, a station near Boulder Creek, and a station at the Chalks near Big Basin State Park. Real-time precipitation data are now available for the Ben Lomond and Chalks stations on the Internet. Data for several other precipitation stations in southern Santa Cruz County are also available.

[1] The reservoir on Yellow Bank Creek failed in February of 1998. Culverts on Yellow Bank Creek and Y Creek may also have failed during the storms of February 1998.



SOURCE: Environmental Science Associates, Pacific Meridian Resources, USGS

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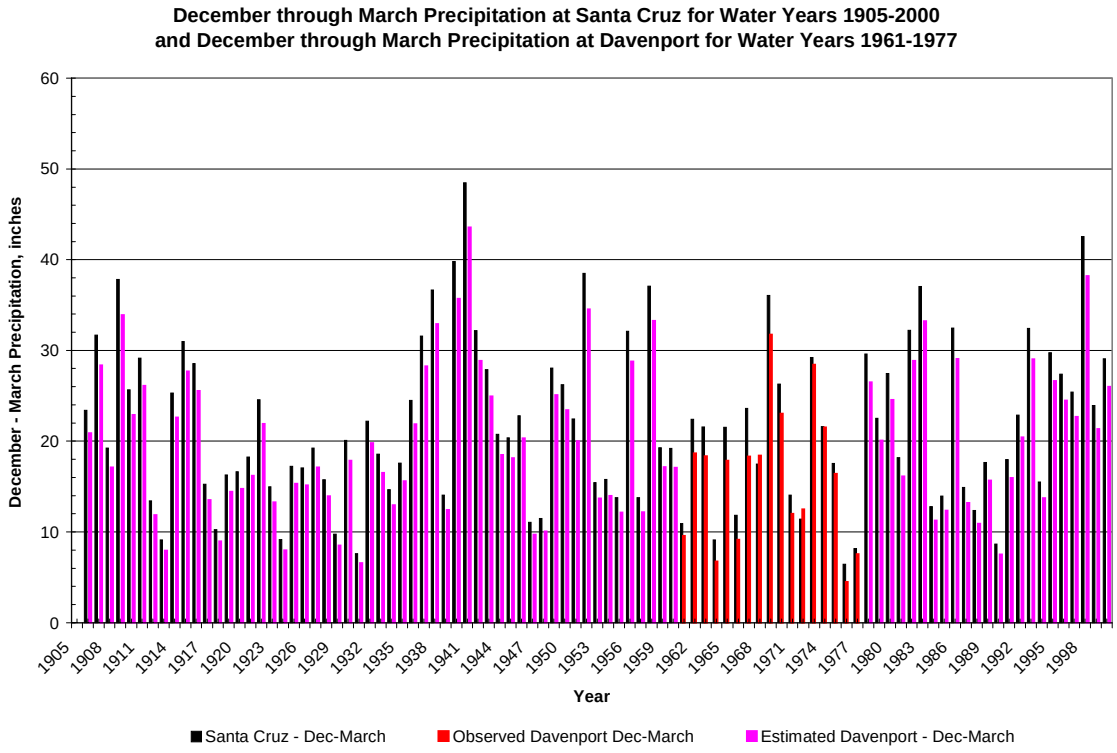
Figure 4.1-1

Elevations of the Coast Dairies Area



Note: The bar graph shows the December through March (winter) precipitation for Santa Cruz from 1905-2000. The precipitation observed at Davenport from 1961 to 1977 is also shown. Precipitation at Davenport for the periods 1905-1960 and 1978-2000 was estimated by linear regression with the Santa Cruz data.

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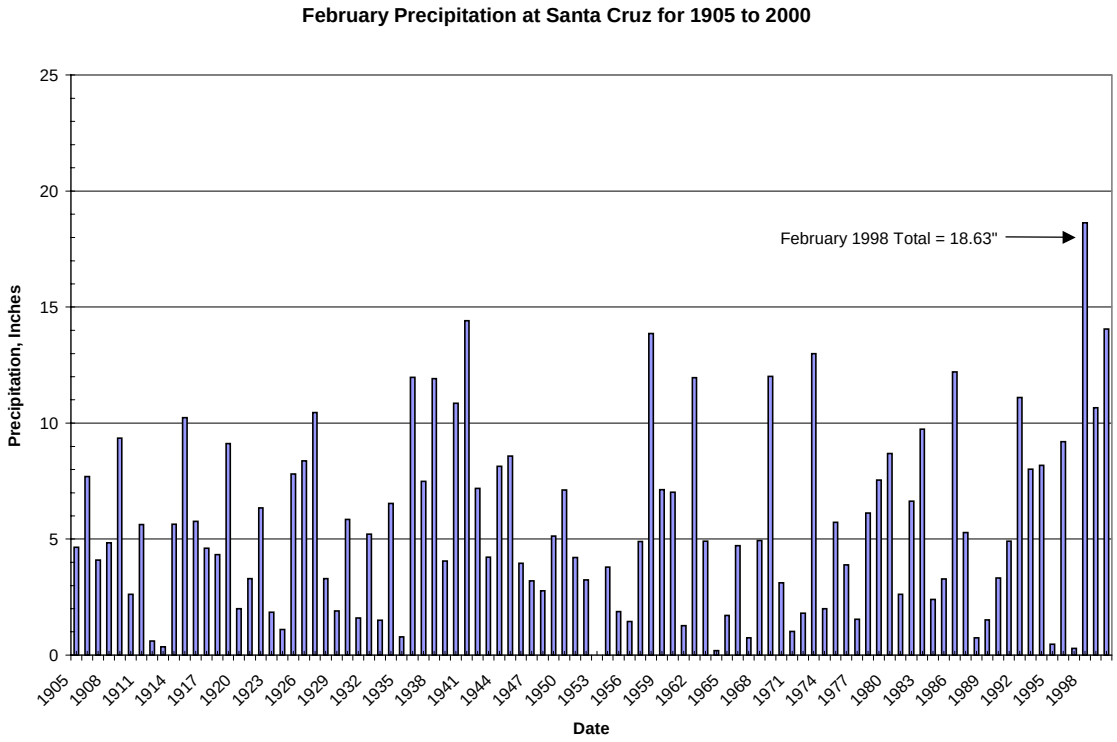
Figure 4.1-2
December through March (winter) Precipitation for Santa Cruz from 1905-2000

4.1.1.3 WATERSHED AREA AND ELEVATION

Figure 4.1-4 shows the cumulative percentage of watershed area in each 200-foot elevation class above each of the nine stream monitoring stations established on the Coast Dairies Property. Table 4.1-1 shows the watershed area upstream of each monitoring station. Table 4.1-1 also shows the 85th-percentile elevation, that is, the elevation below which 85 percent of the watershed lies. Since mean annual precipitation varies with elevation, the 85th-percentile elevation should indicate the relative amount of annual average precipitation each watershed receives.



Note: Santa Cruz total precipitation for the month of February from 1905 to 2000 is shown. The highest February precipitation occurred in 1998.

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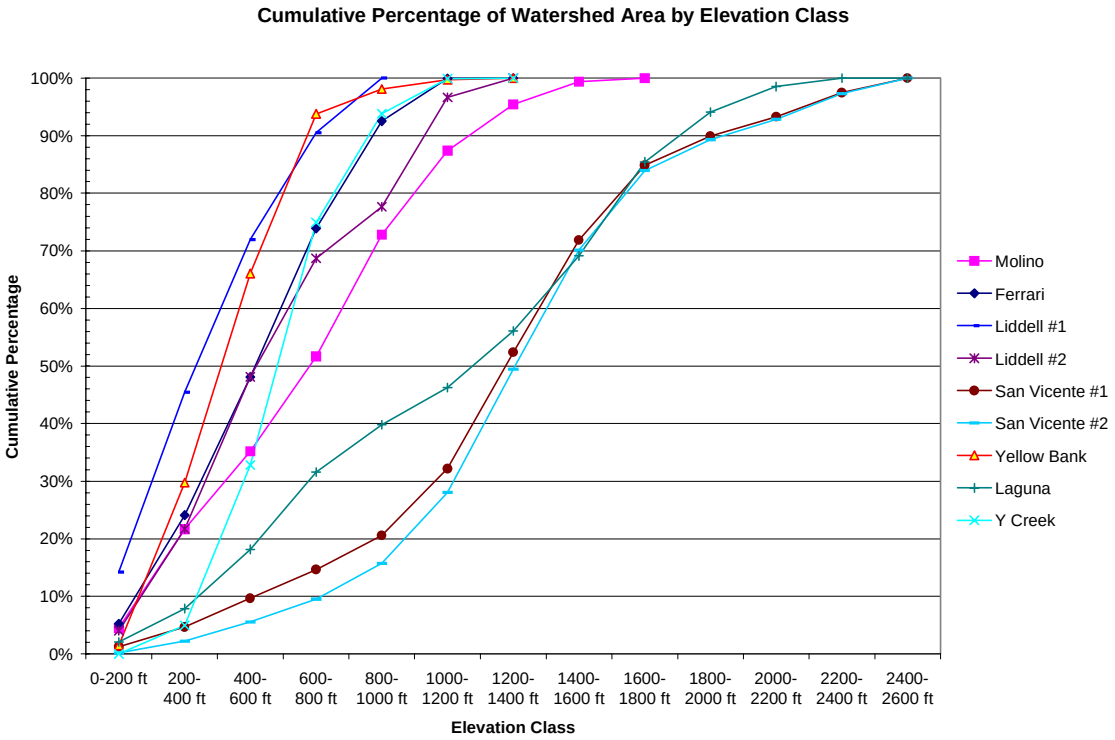
Figure 4.1-3
Santa Cruz total precipitation for the month of February from 1905 to 2000

Table 4.1-1 shows that San Vicente #2 station has 85 percent of its watershed area below 1,990 feet in elevation, and should have the highest mean annual precipitation per unit area of all the watersheds in this study.[2] Laguna Creek station has 85 percent of its watershed area below 1,610 feet in elevation, indicating that this station's watershed should have the second highest mean annual precipitation in the study. Liddell #2 and Molino Creek stations have similar, lower 85th percentile elevations, and Ferrari Creek and Y Creek stations have still lower 85th percentile elevations. Based on their 85th percentile elevations, Liddell #1 and Yellow Bank Creek stations can be expected to have watersheds with the lowest mean annual precipitation per unit area of the nine sampling stations.

[2] Please note that watersheds here are defined as the area that drains to each sampling station; these are not equivalent to the entire watershed of each stream.



Note: The cumulative percentage of watershed area in each 200' elevation class.

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Figure 4.1-4
Cumulative Percentage of Watershed Area in Each 200' Elevation Class

TABLE 4.1-1
WATERSHED AREA AND THE 85-PERCENTILE ELEVATION FOR THE COAST DAIRIES STREAM MONITORING STATIONS.

Monitoring	Total Watershed Area (sq. mi.)	85th Percentile Elevation (feet)
Molino	1.500	1,030
Ferrari	1.284	880
San Vincente	10.493	1,960
San Vincente	9.889	1,990
Liddell #1	1.292	660
Liddell #2	1.904	1,120
Laguna	7.603	1,610
Y Creek	0.794	890

Yellow	0.605	660

4.1.2 METHODOLOGY[3]

In the fall of 2000, the Planning Team established nine stream monitoring stations on the Property: two each on San Vicente Creek, Liddell Creek, and Laguna Creek, and one each on Molino Creek, Ferrari Creek, and Yellow Bank Creek (Figure 4.1-5). Throughout this section, these nine stations serve as the basis for analysis of water flow, water quality, and watersheds. In this way, land use, topography, geology, vegetation, and other factors can be related to the conditions observed in the stream channels themselves.

The evaluation of hydrologic existing conditions on the Property was hindered by the lack of historic records for the Coast Dairies streams, particularly records of stream discharge (rate of flow). The U.S. Geological Survey (USGS) has established gauging stations only San Vicente Creek and Laguna Creek, and the gauging records for these streams is relatively brief (Table 4.1-2). In order to make up for this, the Planning Team's hydrologist, Dennis Jackson, used data from gauging stations on other streams in the Santa Cruz Mountains, and extrapolated this data to the streams on the Coast Dairies Property.

TABLE 4.1-2
U.S. GEOLOGICAL SURVEY STREAM-GAUGING STATIONS
NEAR DAVENPORT CA

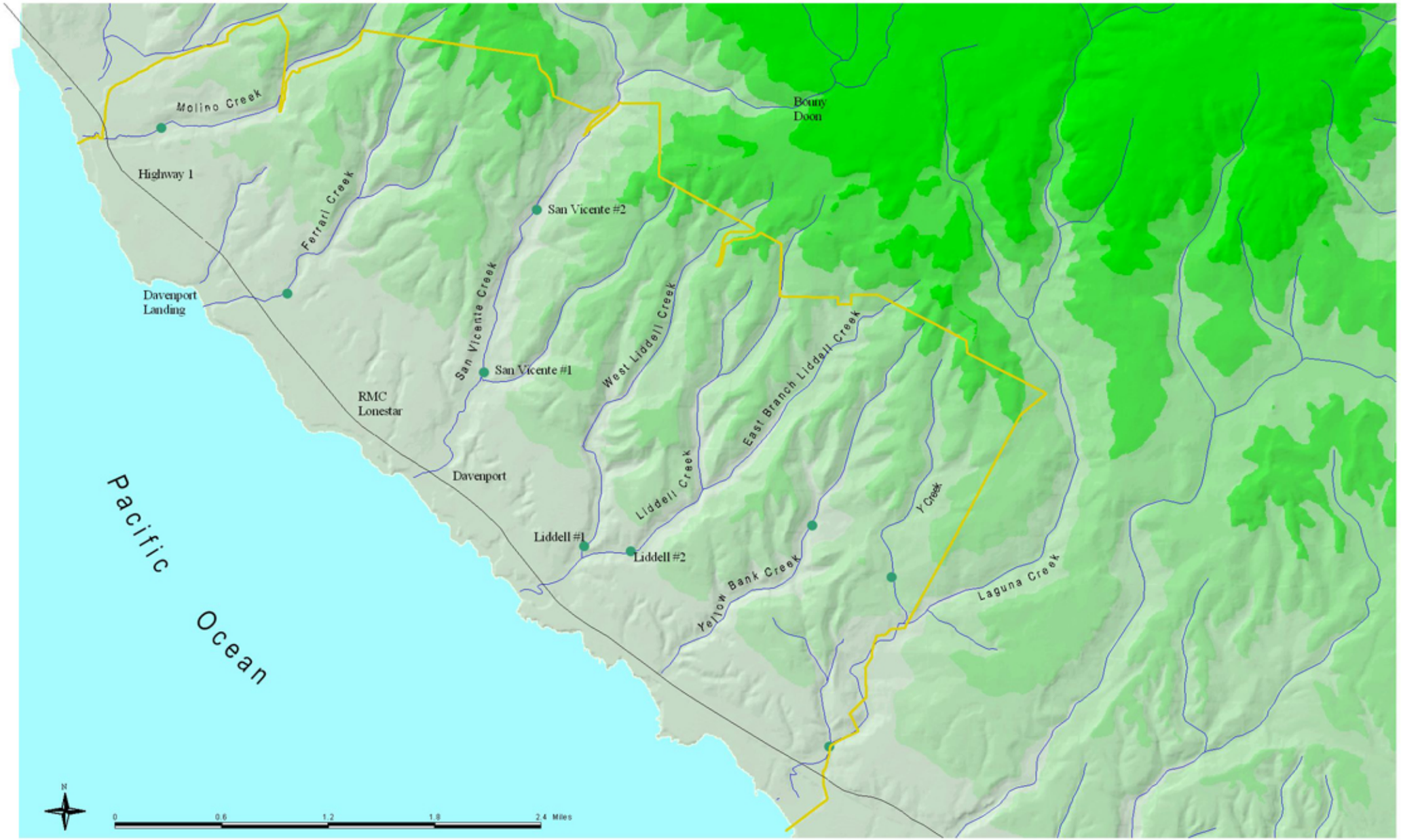
USGS Station Number	Station	Watershed Area	Period of Record	Years of Record	Mean Annual Flood	Unit Mean Annual Flood	1.5-Year Discharge
11161590	Laguna C Nr Davenport	3.07	1970 - 1976	7	137	44.8	83
11161570	Majors C Nr Santa Cruz	3.77	1970 - 1976	7	237	62.9	125
11161800	San Vicente	6.07	1970 - 1983	14	407	67.1	90
11161900	Scott C Ab Little C Nr Davenport Ca	25.1	1937 - 1973	19	1337	53.3	527
11162000	Scott C Nr Davenport Ca	27.3	1937 - 1941	4	2576	94.4	816

4.1.2.1 BANKFULL DISCHARGE

The concept of bankfull is central to understanding the morphology of stream channels. Bankfull discharge, the flow at which the active stream channel is just full, is the discharge that shapes the channel. Leopold, et al (1964) have pointed out that, over an extended period, moderate flood flows move the most sediment: while large flood events move great amounts of material, they are very rare; on the other hand, small floods occur frequently, but do little work. E. D. Andrews (Leopold, 1994 p. 127) demonstrated quantitatively that the "effective discharge," the channel

[3] This part of the Hydrology Section presents a condensed version of the description of the methodology used in the hydrology analysis that was prepared by Planning Team hydrologist Dennis Jackson. The full text of the methodology description is available in the Project Archives.

forming flow, was very close to bankfull discharge. For many rivers, the bankfull discharge occurs about every 1.5 years.



SOURCE: Environmental Science Associates, Pacific Meridian Resources, County of Santa Cruz

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Figure 4.1-5
Stream Monitering Stations
on the Coast Dairies Property

Leopold et al. (1964) observed that the initiation of movement of median size gravel in stream riffles requires a depth of flow equal to 75 percent of the bankfull depth. A flow of this depth has a recurrence interval of about one year. Leopold also noted that the depth of the average annual discharge is approximately 33 percent of the bankfull depth.

The bankfull discharge for each of the nine monitoring stations was estimated using a four-part procedure. First, records from U.S. Geological Survey stream guaging stations, both on the Property and in nearby locations, were used to develop a regional relationship for the 1.5-year discharge based on watershed area (Tables 4.1-2 and 4.1-3, and Figures 4.1-6 and 4.1-7).

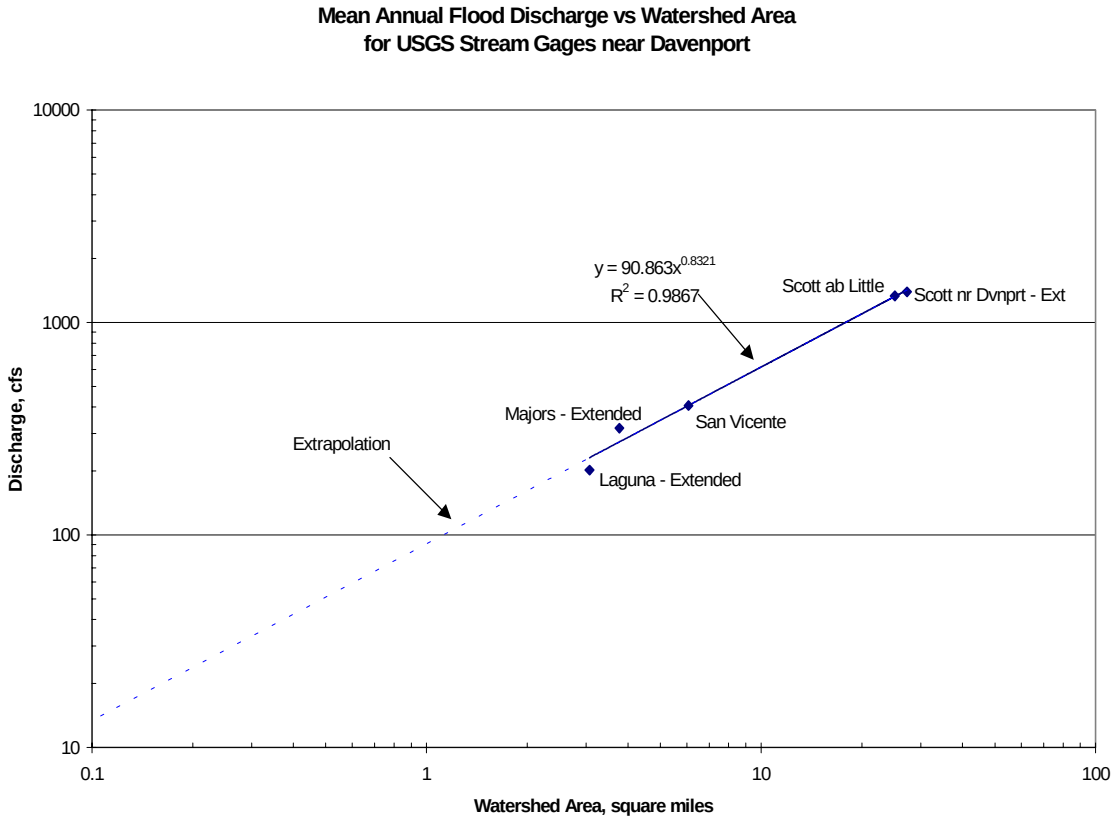
TABLE 4.1-3
CORRELATION OF ANNUAL PEAK FLOOD SERIES FOR NINE USGS GAUGING STATIONS

	San Lorenzo at Big Trees	*Pescadero Creek near Pescadero*	*Corralitos Creek near Freedom*	*San Lorenzo near Boulder Creek*	*Zayante Creek*	***Scott Creek Above Litte***	***Laguna Creek***	***Majors Creek***	***San Vicente***
San Lorenzo at Big Trees	1								
Pescadero Creek near Pescadero	0.9178	1							
Corralitos Creek near Freedom	0.8738	0.7825	1						
San Lorenzo near Boulder Creek	0.9481	0.9399	0.8509	1					
Zayante Creek	0.8384	0.8105	0.6773	0.8700	1				
Scott Creek Above Litte	**0.8304**	0.7375	0.7849	**0.8965**	0.7418	1			
Laguna Creek	0.5890	0.5591	**0.7982**	0.5830	0.4698	**0.7984**	1		
Majors Creek	0.3806	0.4639	0.6301	0.3991	0.2064	**0.7652**	**0.9076**	1	
San Vicente	**0.8592**	0.7598	**0.9160**	0.7123	0.5081	**0.8969**	**0.8487**	**0.9682**	1

TABLE 4.1-4
PREDICTIONS OF THE 1.5-YEAR DISCHARGE FOR THE NINE COAST DAIRIES STREAM MONITORING STATIONS

Monitoring Station	Watershed Area square miles	Lower Limit cfs	Predicted 1.5-Year Discharge cfs	Upper Limit cfs
Molino Creek	1.50	18.4	42.1	96.2
Ferrari Creek	1.28	15.6	36.7	86.3
Lower San Vicente #1	10.49	118.9	229.6	443.3
Upper San Vicente #2	9.89	113.0	218.0	420.5
Liddell #1 West	1.29	15.7	37.0	86.7
Liddell #2 Main	1.90	23.6	51.8	113.8
Y Creek	0.79	9.4	24.2	62.4
Laguna	7.60	89.9	173.3	334.3
Yellow Bank	0.60	7.0	19.1	52.2

Note: The watershed area for six of the stations is less than 3 square miles. Predictions for these six stations are actually extrapolations and may be subject to more error than is apparent from the regression statistics. The upper and lower limit for the 95 percent confidence interval for the predictions is also given.



Note: Mean annual flood versus watershed area for 5 USGS stream gauging stations near Davenport. The annual flood series forScotts Creek near Davenport was extended to 19 years by regression with the record forScotts Creek above Little Creek. The annual flood series for Laguna and Majors Creek were extended by regression with the San Vicente gauge record.

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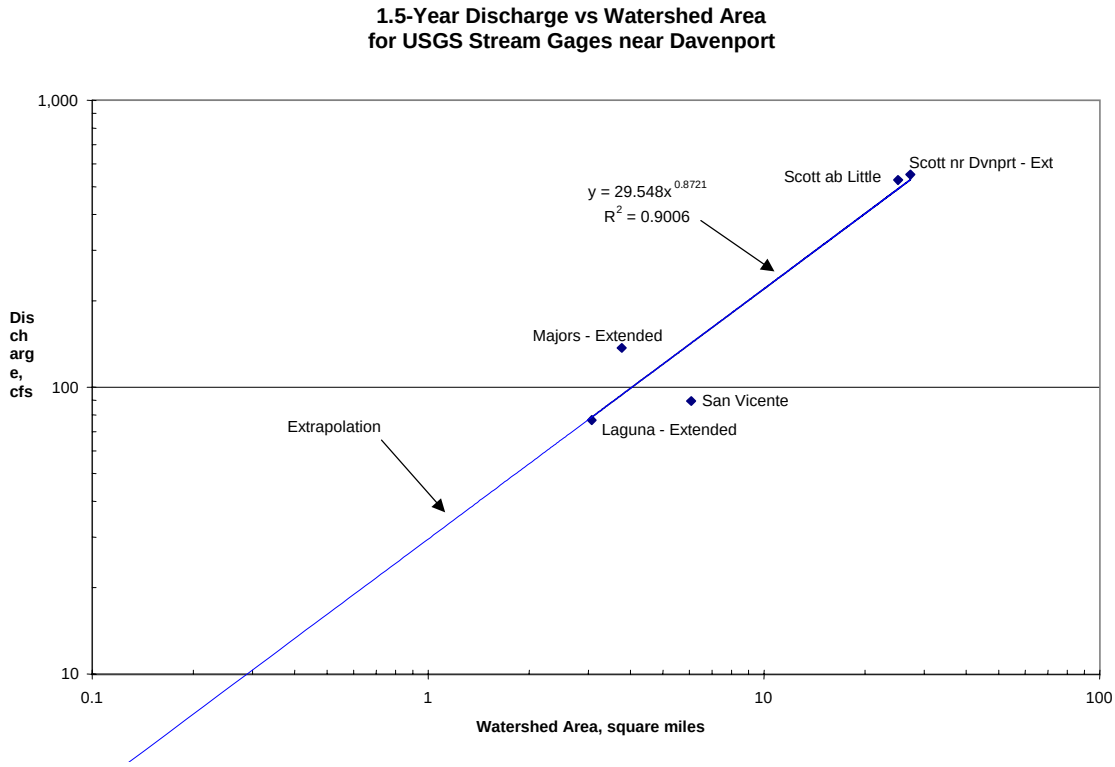
Figure 4.1-6
Mean Annual Flood vs. Watershed Area for
5 USGS Stream Gauging Stations Near Davenport

Second, the Planning Team conducted channel surveys at each station, including identification of bankfull indicators; a longitudinal-profile, approximately 10-bankfull widths in length; installation of a staff guage; a cross section at the riffle crest downstream of the staff gauge; and a survey of the top of the staff gauge. Planning Team hydrologist Dennis Jackson calculated regressions (statistical correlations) for the bankfull indicators, water surface, thalweg (low flow channel), and centerline versus profile distance, and graphed profiles and cross sections for each station (presented later in this section). In addition, a datum (locational coordinates and elevation) was established for each station.



Note: Flood data from the five USGS stream gauging stations near Davenport was used to develop a regional relationship between the 1.5-year discharge and watershed area. The flood records for Laguna Creek and Majors Creek were extended by regression against the San Vicente flood record. The flood record forScotts Creek near Davenport was extended by regression against the record fromScotts Creek above Little Creek.

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Figure 4.1-7
1.5-Year Discharge vs. Watershed Area for
5 USGS Stream Gages near Davenport

Third, Planning Team members took discharge measurements at each station monthly between fall of 2000 and spring of 2001, and also during several storm events during the winter of 2000-2001. Based on the discharge measurements and the depth of the water measured at the staff gauge at the time the discharge measurements were taken (Table 4.1-5), a rating curve was developed for each station. The rating curve can be used to determine discharge simply by measuring water depth at the staff gauge. Fourth, the Team combined information from the channel surveys and discharge measurements for each station. This included an estimate of the discharge associated with the observed bankfull indicators, and calculations of the elevation of the water surface for the estimated 1.5-year discharge. The final estimate for the bankfull discharge was based on a comparison of estimated water surface elevation of the 1.5-year discharge with the level of the bankfull indicators (Table 4.1-6).

TABLE 4.1-5
RANGE OF DISCHARGE MEASUREMENTS AND THE ASSOCIATED RANGE OF DEPTH AND STAGE

Monitoring Station	Watershed Area sq. mi.	Lowest Stage feet	Highest Stage feet	Lowest Depth feet	Highest Depth feet	Lowest Discharge cfs	Highest Discharge cfs
Molino	1.500	0.98	1.47	0.37	0.72	0.72	7.69
Ferrari	1.284	0.6	1.23	0.25	0.72	0.37	6.21
San Vicente #1	10.493	1.47	2.03	0.73	1.14	11.21	42.32
San Vicente #2	9.889	1.33	1.94	0.82	0.99	10.14	41.24
Liddell #1 (West)	1.292	0.94	1.2	0.57	0.75	1.72	5.55
Liddell #2	1.904	1.21	1.42	0.31	0.58	1.76	6.26
Laguna	7.603	0.93	1.35	0.64	1.12	5.75	22.15
Y Creek	0.794	0.54	0.84	0.35	0.64	0.48	5.14
Yellowbank	0.605	0.89	1.19	0.24	0.44	0.31	2.35

TABLE 4.1-6
COMPARISON OF THE ESTIMATED 1.5-YEAR DISCHARGE AND THE ESTIMATED BANKFULL DISCHARGE ADOPTED FOR EACH OF THE NINE MONITORING STATIONS

Monitoring Station	Watershed Area sq miles	Estimated 1.5-Year Discharge	Final Bankfull Bankfull Discharge cfs	Final Bankfull Stage feet	Final Bankfull Velocity feet/sec	Final Bankfull Depth feet
Molino	1.50	42.1	45.0	2.00	4.0	1.17
Ferrari	1.28	36.7	36.7	1.91	2.3	1.45
Lower San Vicente	10.49	229.5	252.0	3.13	5.0	2.09
Upper San Vicente	9.89	218.0	223.2	2.77	6.3	1.58
West Liddell	1.29	37.0	38.8	1.82	4.1	1.20
East Liddell	1.90	51.8	46.9	2.12	3.4	1.05
Laguna	7.60	173.3	238.9	2.59	5.6	2.94
Y Creek	0.79	24.2	24.8	1.64	3.2	1.22
Yellowbank	0.60	19.1	19.1	1.73	3.2	0.68

4.1.2.2 FISH FLOWS

Salmonids require different amounts of water for their various life stages. Recently, National Marine Fisheries Service (NMFS) has adopted a policy of recommending that the minimum bypass flow for new water rights diversions be set at the February median flow. NMFS recommends that the maximum instantaneous diversion rate not exceed 15 percent of the estimated winter 20 percent exceedence flow. In other words, the total of all diversions at any given point in time should not exceed 15 percent of the flow that is exceeded 20 percent of the

time during the winter. For example, if winter flows in a given stream are greater than 10 cubic feet per second (cfs) only 20 percent of the time, then the maximum amount that could be diverted from this stream is 1.5 cfs, which is 15 percent of 10.

The Planning Team estimated February median discharge and the estimated winter 20 percent exceedence discharge by constructing regional exceedence curves. These show the relationship between flow and watershed area, and are based on four USGS stations near Davenport. These relationships were used to estimate the February median discharge and the winter 20 percent exceedence discharge at each of the nine stream monitoring stations.

4.1.2.3 REGIONAL FLOW DURATION CURVE

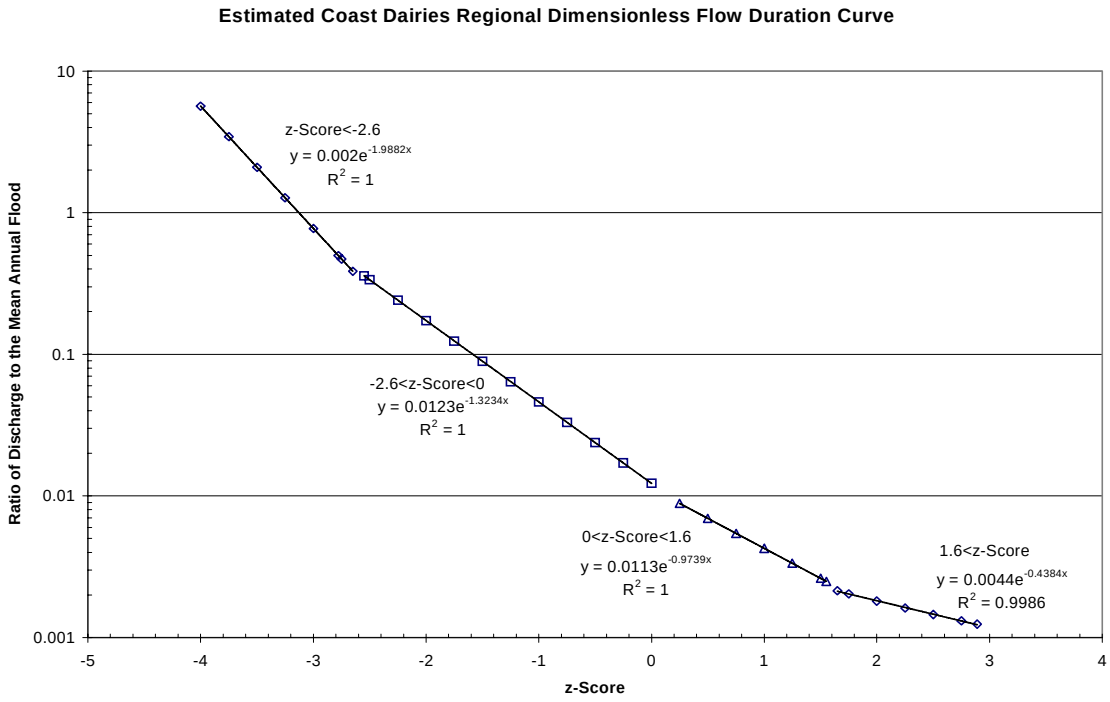
A flow duration curve for a stream gauging station gives the probability that a given discharge will be equaled or exceeded. Flow duration curves are used to predict the return frequency for a given sized flood event. A dimensionless regional flow duration curve for the Coast Dairies streams was created by averaging the dimensionless flow duration curves for the USGS stream gauges on San Vicente Creek and Laguna Creeks, using the Weibull Plotting Position (Figure 4.1-8).

Flow duration curves were constructed for each of the nine stream monitoring stations on the Coast Dairies property by multiplying the predicted dimensionless discharge by the mean annual flood for each station estimated from the watershed area. The flow duration curves for the Coast Dairies stations were then converted to exceedence probability, and are shown in Figure 4.1-9.

Multiplying the exceedence probability by 3,652.5 days gives an estimate of the flow duration for a theoretical ten-year period (Figure 4.1-10). The flow duration curve combines data from wet years and dry years, so it can not be used directly to estimate the number of days a discharge will be equaled or exceeded in a given year.

4.1.2.4 CONSTRUCTION OF HYDROGRAPHS

Of the six streams on the Property, only San Vicente Creek and Laguna Creek have had their flows gauged by the U.S. Geological Survey (USGS). San Vicente Creek has the longer gauging record, from 1937 to 1940, and again from 1969 through 1985; Laguna Creek was gauged for only seven years. In the absence of flow records for the other four streams on the Property, the Planning Team constructed synthetic hydrographs for each of the nine stream monitoring stations based on the USGS San Vicente stream gauging station and our calculation of the regional mean annual flood for a given watershed area. The synthetic hydrographs should be viewed only as a guide to the range of flows that may have occurred at the monitoring stations for the 1969 to 1985 period. It is assumed that stream flow during this period is representative of recent history conditions.



Note: The estimated regional flow duration curve for the Coast Dairies Property. The curve is the average of the data for the USGS stations on San Vicente and Laguna Creeks. A z-score of 0.0 indicates a 50 percent exceedence probability.

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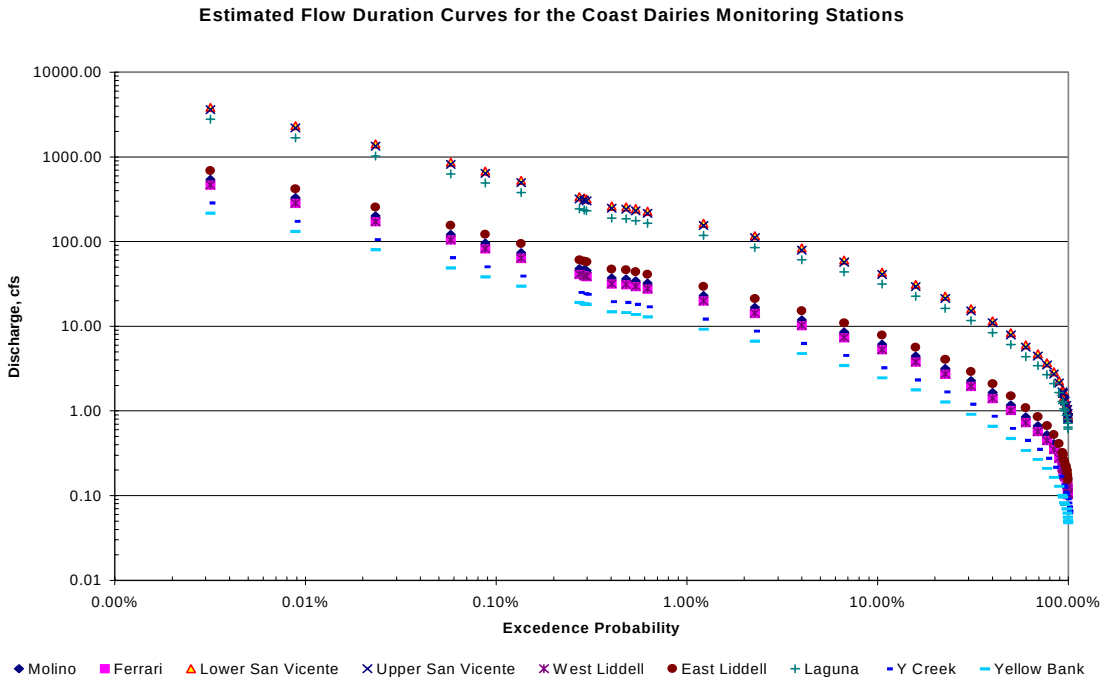
Figure 4.1-8
Regional Flow Duration Curve for the Coast Dairies Property

The Planning Team then converted the daily average discharge hydrograph for the San Vicente gauge to a dimensionless form by dividing each daily average discharge by the mean annual flood for the San Vicente gauge. The mean annual flood for the USGS San Vicente gauge is 407 cfs, based on data collected in the 1937 to 1940 and 1969 to 1984 water years. Figure 4.1-11 shows the dimensionless (relative discharge) hydrograph for the USGS gauge on San Vicente Creek.

Next, the synthetic hydrographs for each of the nine stream monitoring stations on the Coast Dairies Property were obtained by multiplying the relative discharge of the dimensionless hydrograph for USGS San Vicente gauge by the mean annual flood for each monitoring station estimated from its watershed area. All of the synthetic hydrographs will have the same shape and will differ only in the value of the predicted discharge; there will be no differences in the timing or the relative amplitude of the discharge peaks.



Note: Estimated flow duration curves for the nine Coast Dairies stream monitoring stations. The values on the x-axis have been converted from z-score to exceedence probability.

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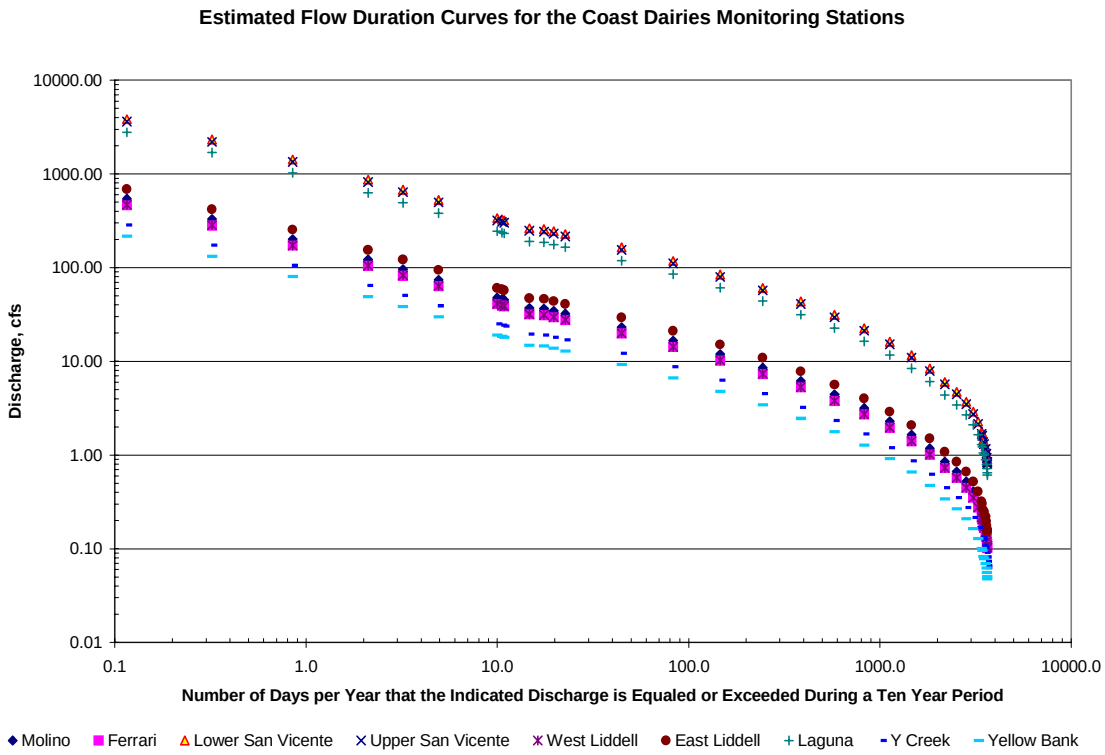
Figure 4.1-9
Estimated Flow Duration Curves
(Expressed as Exceedence Probability)
for the Nine Coast Dairies Stream Monitoring Stations

4.1.2.5 TURBIDITY AND SUSPENDED SEDIMENT

In hydrologic terms, turbidity is a measurement of the opacity of the water, and it is a direct indicator of the dissolved sediment load carried by a stream. Suspended sediment is sediment that is held in suspension by flowing water. Both turbidity and suspended sediment are relatively easy to sample, and together give a good indication of the amount of sediment carried by a stream.[4] When sampling of turbidity and suspended sediment is coupled with measurement of stream discharge, a statistical relationship can be developed between sediment load and flow. This allows researchers to compare the sediment loads of different streams; to relate water quality to the natural sensitivity to disturbance of a stream's watershed and to the level of disturbance in the watershed; and to monitor changes over time that may be attributable to new disturbances or to watershed restoration efforts.

4 Other components of a stream's sediment load are bedload and washload.



Note: Estimated flow duration curves for the nine Coast Dairies stream monitoring stations. The values on the x-axis have been converted from exceedence probability to the number of days during a *theoretical* ten year period that the indicated discharge is equaled or exceeded.

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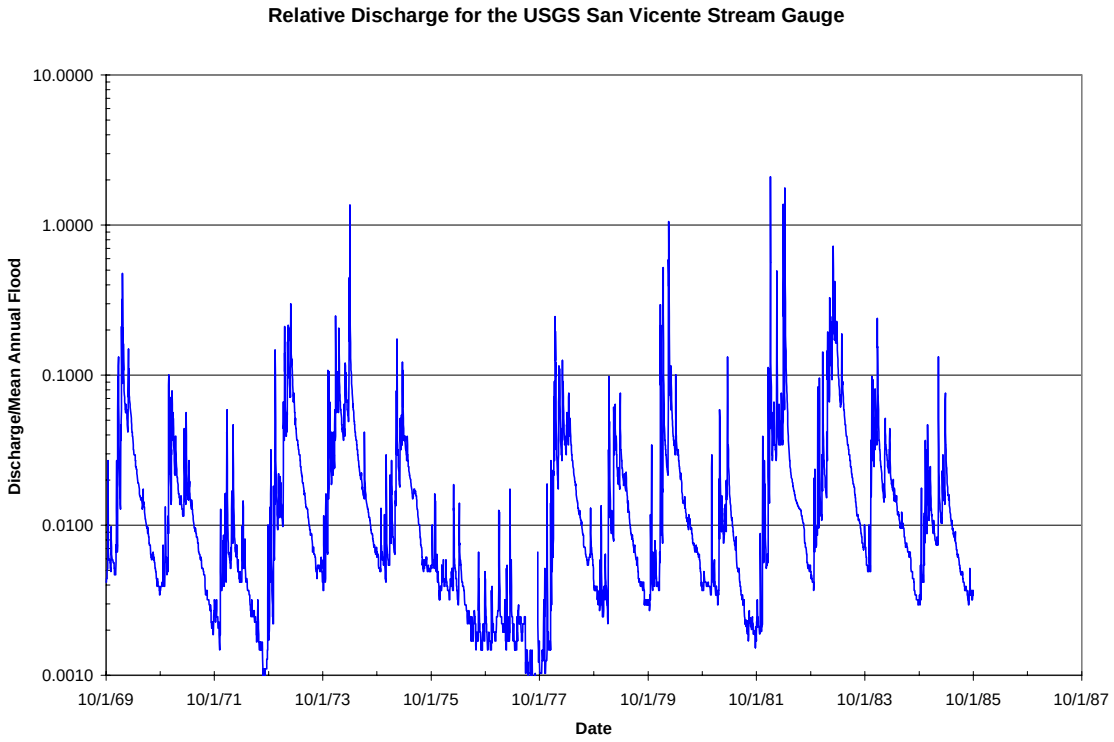
Figure 4.1-10
Estimated Flow Duration Curves
(Expressed as Number of Days in a 10 Year Period)
for the Nine Coast Dairies Stream Monitoring Stations

The Planning Team took turbidity and suspended sediment grab samples on a monthly basis between fall of 2000 and spring of 2001, and during several storm events during the winter of 2000-2001. If Planning Team members did not measure discharge at the time samples were collected, they instead measured the height of the water on the staff gauge (stage), which was later used to estimate the discharge. The turbidity readings (turbidity is measured in units of NTU, a measurement of the scattering of light) were made in the field with a portable Hach turbidity meter. A total of 81 turbidity measurements were made at the nine stream monitoring stations. The suspended sediment samples were sent to a laboratory for analysis. The procedure to determine the concentration of the suspended sediment had a no-detect limit of 5 milligrams per liter. A total of 66 suspended sediment samples were collected at the nine stations. However, 33 of the suspended

sediment samples had concentrations below the no-detect limit. Thus, only 33 suspended sediment samples were available for use in linear regression against discharge or turbidity.



Note: The relative discharge is the daily average discharge divided by the mean annual flood. The graph shows the relative discharge for the USGS stream gauge on San Vicente Creek. The mean annual flood for USGS gauge on San Vicente Creek is 407 cfs. The mean annual flood is calculated from the data collected during the 1937-1940, and 1969-1984 water years.

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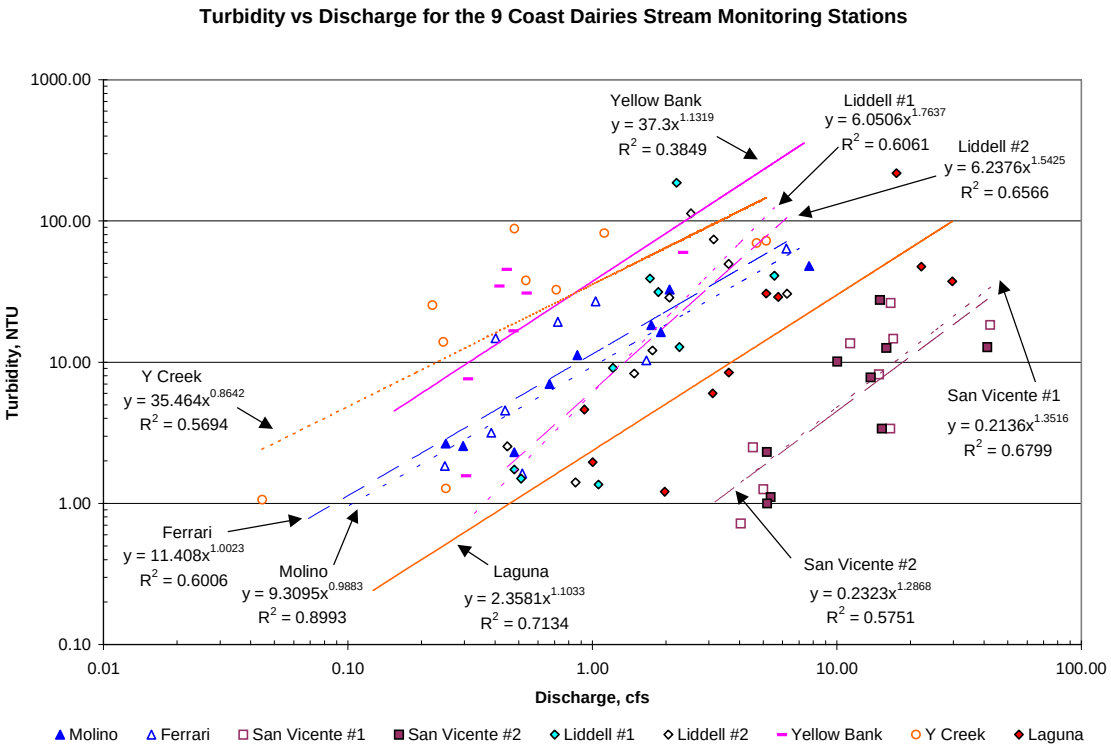
Figure 4.1-11
Relative Discharge for the
USGS Gauging Station at San Vicente Creek

Leopold et al. (1964) note that, "…the rising limb of the hydrograph is characterized by a larger sediment load, a higher velocity, and a smaller depth than the same discharge on the falling limb of the hydrograph." A large number of samples, taken before, during, and after the peaks of flood events, are required to define the true relationship between discharge and suspended sediment. Sediment sampling of the Coast Dairies streams was conducted only over a short period of time, and during a dry winter that never produced a large flood event. Clearly, the data collected for this study are insufficient to determine the true relationship between sediment load and discharge.

A rough guide to the relative magnitude of the sediment load at each of the nine monitoring stations can, however, be made with the data that were collected. While there were not enough suspended sediment samples to develop relationships between this parameter and discharge, turbidity itself is a good indicator of total sediment load, and a sufficient number of

samples were taken to develop a reasonably accurate correlation of turbidity with discharge. Figure 4.1-12 shows the relationship between turbidity and discharge for each monitoring station. Six of the relationships are based on 9 observations. Seven turbidity samples were collected for Yellow Bank Creek. Ten turbidity measurements were made for Laguna Creek and Y Creek.



Note: The turbidity versus discharge relationship for the nine Coast Dairies stream monitoring stations. Six of the relationships are based on 9 observations. Seven turbidity samples were collected for Yellow Bank Creek. Ten turbidity measurements were made for Laguna Creek and Y Creek.

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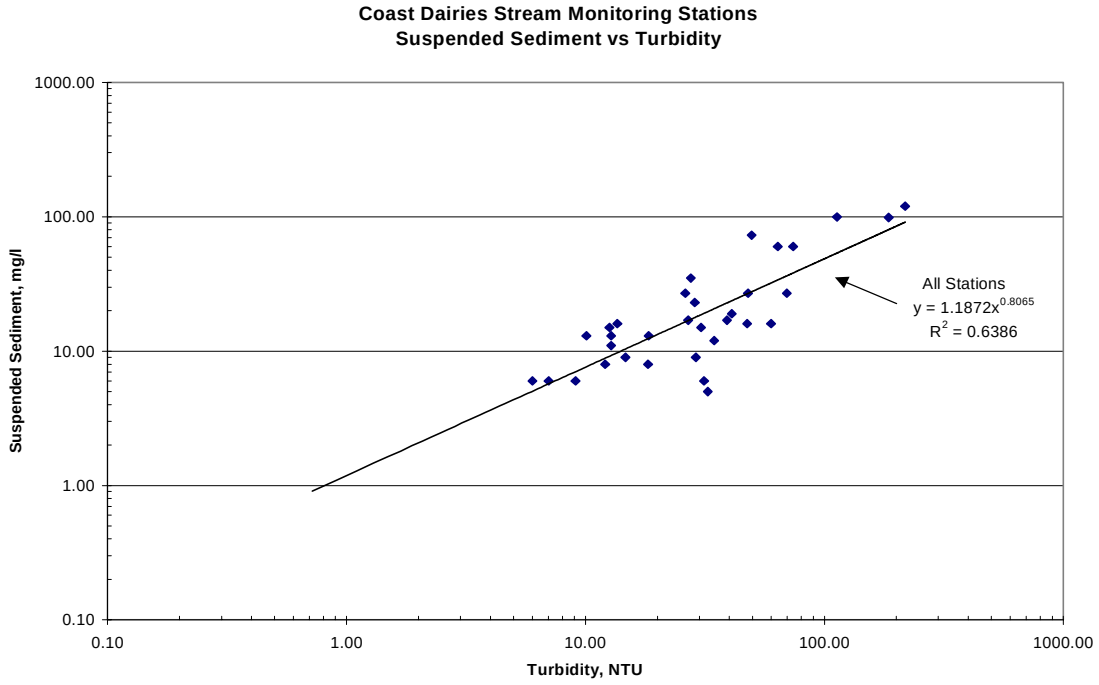
Figure 4.1-12
Turbidity Versus Discharge Relationship for the Nine Coast Dairies Stream Monitoring Stations

In addition, it was possible with the data collected to develop a regional relationship between suspended sediment and turbidity, based on the aggregated data collected at all of the monitoring stations (Figure 4.1-13) Turbidity explains about 64 percent of the variation in the suspended sediment value for the 33 available observations.[5] In other words, there is a fairly strong statistical

5 By comparison, the composite relationship for suspended sediment versus discharge explained only about 6% of the observed variation in suspended sediment values. This poor relationship is due to the limited number of suspended sediment samples that were above the no-detect limit.

correlation in the Coast Dairies streams between high turbidity levels and high suspended sediment levels.



Note: A relationship between suspended sediment and turbidity was developed from the data collected at all of the monitoring stations. Turbidity explains about 64 percent of the variation in the suspended sediment value for the 33 available observations. The composite relationship for suspended sediment versus discharge explained about 6 percent of the observed variation in suspended sediment values.

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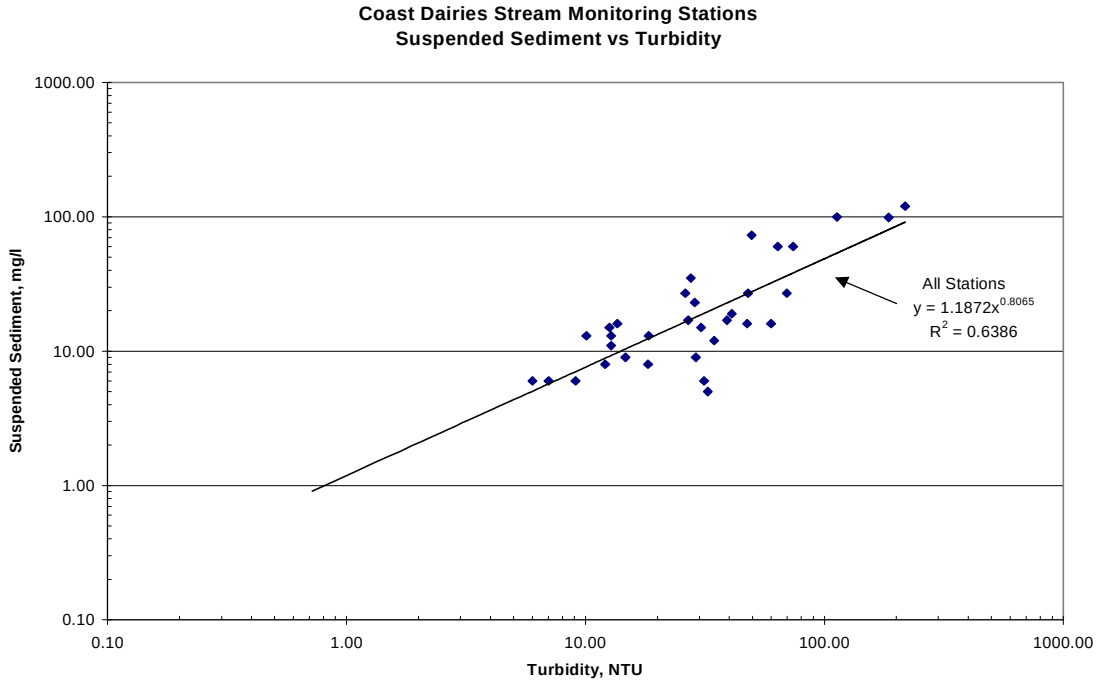
Figure 4.1-13
Relationship Between Suspended Sediment and Turbidity for Coast Dairies Streams

4.1.3 DISCUSSION OF THE NINE MONITORING STATIONS

In the fall of 2000, the Planning Team established nine stream monitoring stations on the Property (Figure 4.1-5). Two stations were established on each of San Vicente Creek, Liddell Creek and Laguna Creek, and one station was established on each of Molino Creek, Ferrari Creek, and Yellow Bank Creek.

Planning Team members collected water quality, discharge, and topographic survey information at each monitoring station beginning in October, 2000. The Planning Team will continue to collect water quality and discharge information through the summer of 2001. During the winter, Planning Team members collected water quality and discharge information during several storm

correlation in the Coast Dairies streams between high turbidity levels and high suspended sediment levels.



Note: A relationship between suspended sediment and turbidity was developed from the data collected at all of the monitoring stations. Turbidity explains about 64 percent of the variation in the suspended sediment value for the 33 available observations. The composite relationship for suspended sediment versus discharge explained about 6 percent of the observed variation in suspended sediment values.

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Figure 4.1-13
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Planning Team members collected water quality, discharge, and topographic survey information at each monitoring station beginning in October, 2000. The Planning Team will continue to collect water quality and discharge information through the summer of 2001. During the winter, Planning Team members collected water quality and discharge information during several storm

events. It should be noted, however, that the winter of 2000-2001 was exceptionally mild, with no large storm events.

In this section, information is presented for each of the nine stations, including a general description of the station and its watershed; the relationship between stage (water depth) and discharge that was used to develop a rating curve for the station; findings of the investigation of bankfull discharge; the results of the turbidity and suspended sediment sampling; and the statistical relationships between turbidity, suspended sediment, and discharge. Some of this information is summarized in Table 4.1-7. In addition, for each of the nine stations, graphs representing cross section and longitudinal profile are shown.

TABLE 4.1-7
SUMMARY OF DATA FROM NINE MONITORING STATIONS

Monitoring Station	Watershed Area square miles	Elevation feet	Estimated Bankfull Discharge cfs	Bankfull Water Surface Slope	Estimated Bankfull Width feet	Length of Channel Surveyed feet
Molino Creek	1.50	70	32	0.0103	9.3	150
Ferrari Creek	1.28	80	37	0.0259	11.1	106
Lower San Vicente #1	10.49	50	252	0.0129	24.3	224
Upper San Vicente #2	9.89	150	223	0.0189	22.2	309
Liddell #1 West	1.29	40	39	0.0133	7.9	80
Liddell #2 Main	1.90	50	47	0.0159	12.9	160
Laguna	7.60	20	239	0.0068	23.9	242
Y Creek	0.79	320	25	0.0166	6.3	69
Yellow Bank	0.62	160	19	0.0223	8.8	114

Note: The nine monitoring stations are located on six streams. Y Creek, a tributary of Laguna Creek, incised this winter. The slope given for Y Creek is the pre-incision slope.

4.1.3.1 MOLINO CREEK

For a general description of run-of-the-stream conditions, see Section 3.3.

The monitoring station for Molino Creek is located about 200 feet upstream of Swanton Road. There is a reservoir upstream of the monitoring station approximately 2,300 feet. The dam for the reservoir partially failed during February of 2000. The reservoir gates were kept open during the winter of 2000-2001 when the streamflow was monitored, so the reservoir probably did not affect the discharge of Molino Creek at the monitoring station during the study period.

About 84 percent of the 1.5 square mile watershed above the Molino Creek monitoring station is underlain by the Santa Cruz Mudstone formation (see Figure 4.2-2 in the next Section of this report). The Santa Margarita Sandstone underlies about 7 percent of the watershed. The outcrop of the Santa Margarita Sandstone lies along the upper 5,000 feet of Molino Creek. However, there is a ribbon of quartz diorite rock along the stream channel that is about 2,000 feet long and within the sandstone outcrop. The Santa Margarita Sandstone is very erosive if disturbed. Exposures of the sandstone in the creek have the potential to provide sediment directly to the creek. The highest point in the watershed is 1,690 feet (Figure 4.1-1). Eighty-five percent of the watershed lies below 1,030 feet in elevation.

The channel was surveyed on December 4, 2000. The elevation of the monitoring station is about 70 feet. The staff gauge is located in a deep pool, and the cross section is about 25 feet downstream of the staff gauge at an old road crossing, which does not appear to have been used recently. The channel below the riffle crest was filled with an aquatic weed, as was the riffle above the gauging pool. There is a large slide on the west bank that extends from the old highway to well past the monitoring station. The cross section and longitudinal profile are shown in Figure 4.1-14.

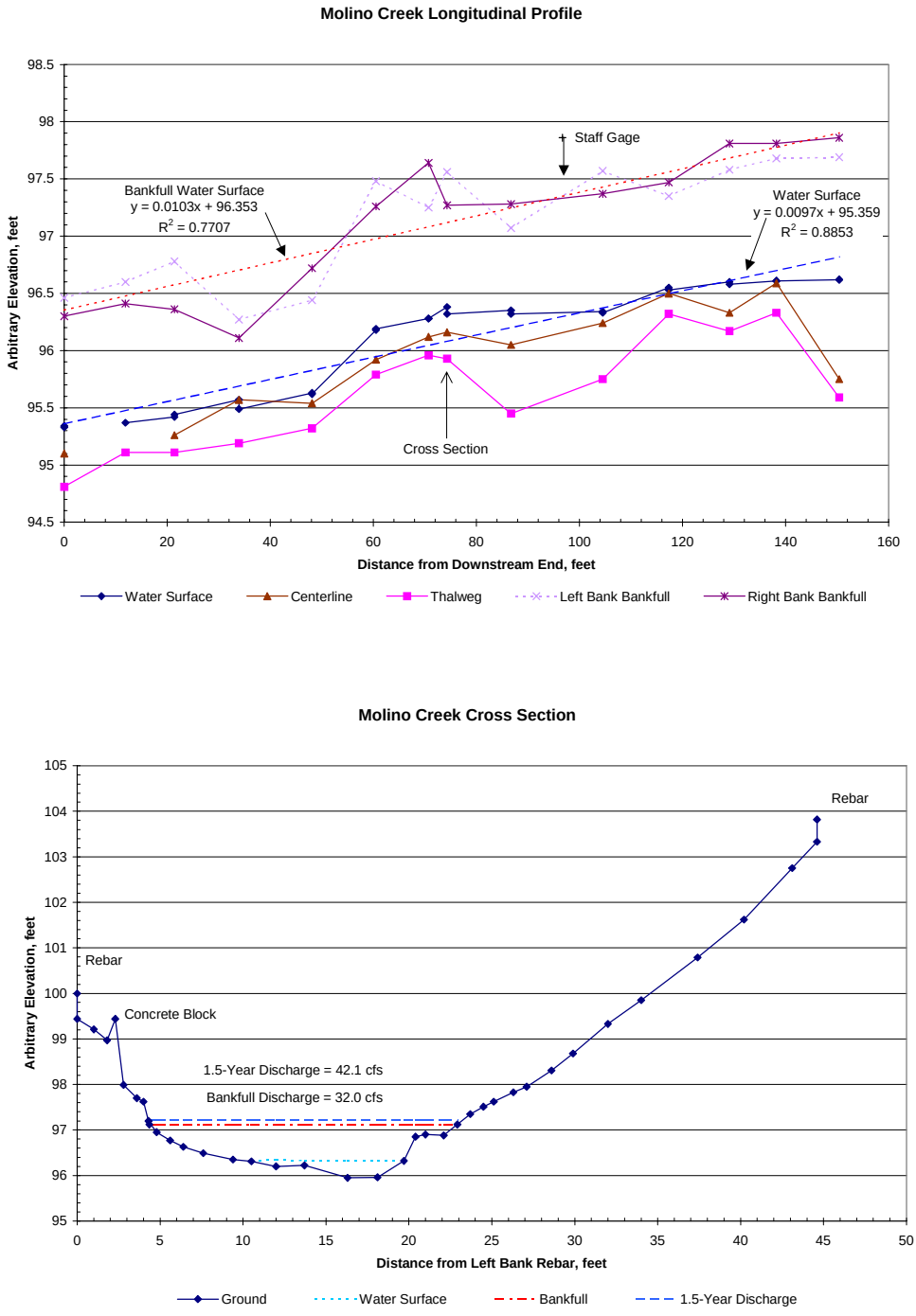
Stage-Discharge Relationship

A total of four discharge measurements were made ranging from about 0.7 cfs to about 7.7 cfs. This corresponds to a range of 1.7 - 18.3 percent of the estimated 1.5-year discharge for the station. The discharge rating was determined to be:

$$\text{Discharge} = 0.8446(\text{Gauge Height})^{5.7572} \qquad R2 = 0.9992$$

Bankfull Discharge

The level of bankfull, determined by the regression on all of the indicators within the surveyed reached, gave an estimate of 32.0 cfs for the bankfull discharge with a velocity of 3.2 feet per second. The bankfull indicator on the right-bank gave a bankfull discharge of 62.2 cfs with a velocity of 4.9 feet per second. Both of these values are within the confidence band of the predicted 1.5-year discharge. The bankfull indicator on the left-bank gave a bankfull discharge of 124 cfs with a velocity of 7.5 feet per second, which was considered too high to represent bankfull. The velocity of the bankfull discharge from the regression procedure is below the expected range of about 4 to 6 feet per second. Therefore, the average of the stage of the right-bank indicators and the stage from the regression procedure was adopted as the bankfull level, yielding a bankfull discharge of 45.0 cfs with a velocity of 4.0 feet per second.



Note: The upper graph shows the longitudinal profile for Molino Creek. The lower graph shows Molino Creek in cross section.

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Figure 4.1-14
Longitudinal Profile and Cross Section for Molino Creek Monitoring Station

Turbidity and Suspended Sediment

Nine turbidity measurements were made (N=9), three of them at the same time that discharge measurements were made. The discharge for the other six turbidity measurements was estimated from the stage. Measured turbidity ranged from 2.3 NTU to 47.9 NTU. The following turbidity-discharge relationship was found by regression.

$$\text{Turbidity} = 9.3095(\text{Discharge})^{0.9883} \qquad R^2 = 0.8993 \qquad N = 9$$

Six suspended sediment measurements were made but three of them were found to be below the no-detect limit. The three suspended sediment samples with values greater than the 5 mg/l no-detect limit were used to estimate the relationship between suspended sediment and discharge.

$$\text{Suspended Sediment} = 6.8669(\text{Discharge})^{-0.6328} \qquad R^2 = 0.9529 \qquad N = 3$$

The R^2 value of 0.9529 indicates that the three measurements show a strong relationship between suspended sediment and discharge, but the high R^2 value is the result of the very small sample size.

Three paired measurements of suspended sediment and turbidity were available. A regression of suspended sediment versus turbidity gave the following equation.

$$\text{Suspended Sediment} = 1.1165(\text{Turbidity})^{0.7836} \qquad R^2 = 0.888$$

The R^2 value of 0.888 shows that turbidity explains about 89 percent of the variation in the suspended sediment values, in these three measurements. But again, the high R^2 value is affected by the small sample size, and many more samples are needed to define the relationship adequately.

4.1.3.2 FERRARI CREEK

Ferrari Creek is a local name for a the creek that drains to the east of Davenport Landing. For a general description of run-of-the-stream conditions, see Section 3.3.

The monitoring station on Ferrari Creek is in a pasture adjacent to a cattle-feeding area, about 150 feet upstream of Cement Plant Road. The cattle have free access to the creek near the monitoring station. The creek flows over several bedrock outcrops in the pasture upstream of the monitoring station.

The watershed area above the monitoring station is 1.28 square miles. The highest elevation in the watershed is about 1,200 feet. Eighty-five percent of the watershed has an elevation of less than 880 feet. About 23 percent of the Ferrari Creek watershed has slopes steeper than 20 percent (Figure 4.1-15). By this measure, Ferrari Creek has the steepest of all the watersheds. About 42 percent of the watershed is in the 0-10 percent slope class.

Approximately 90 percent of the watershed above the monitoring station is underlain by Santa Cruz Mudstone formation, a rock type with a low density that is relatively easily moved by flood flows. No Santa Margarita Sandstone is shown on the geology map above the Ferrari Creek monitoring station.

The channel was surveyed on December 4, 2000. The monitoring station has an elevation of about 80 feet. The staff gauge is in a shallow pool. The cross section is about 8 feet downstream of the staff gauge. The channel below the riffle crest narrows as it flows over a bedrock outcrop. The cross section and longitudinal profile are shown in Figure 4.1-16.

Stage-Discharge Relationship

A total of four discharge measurements were made ranging from about 0.37 cfs to about 6.2 cfs. This corresponds to a range of 1.1 - 16.9 percent of the estimated 1.5-year discharge for the station. The discharge rating was determined to be:

$$\text{Discharge} = 2.9591(\text{Gauge Height})^{3.8792} \qquad R2 = 0.9807$$

Bankfull Discharge

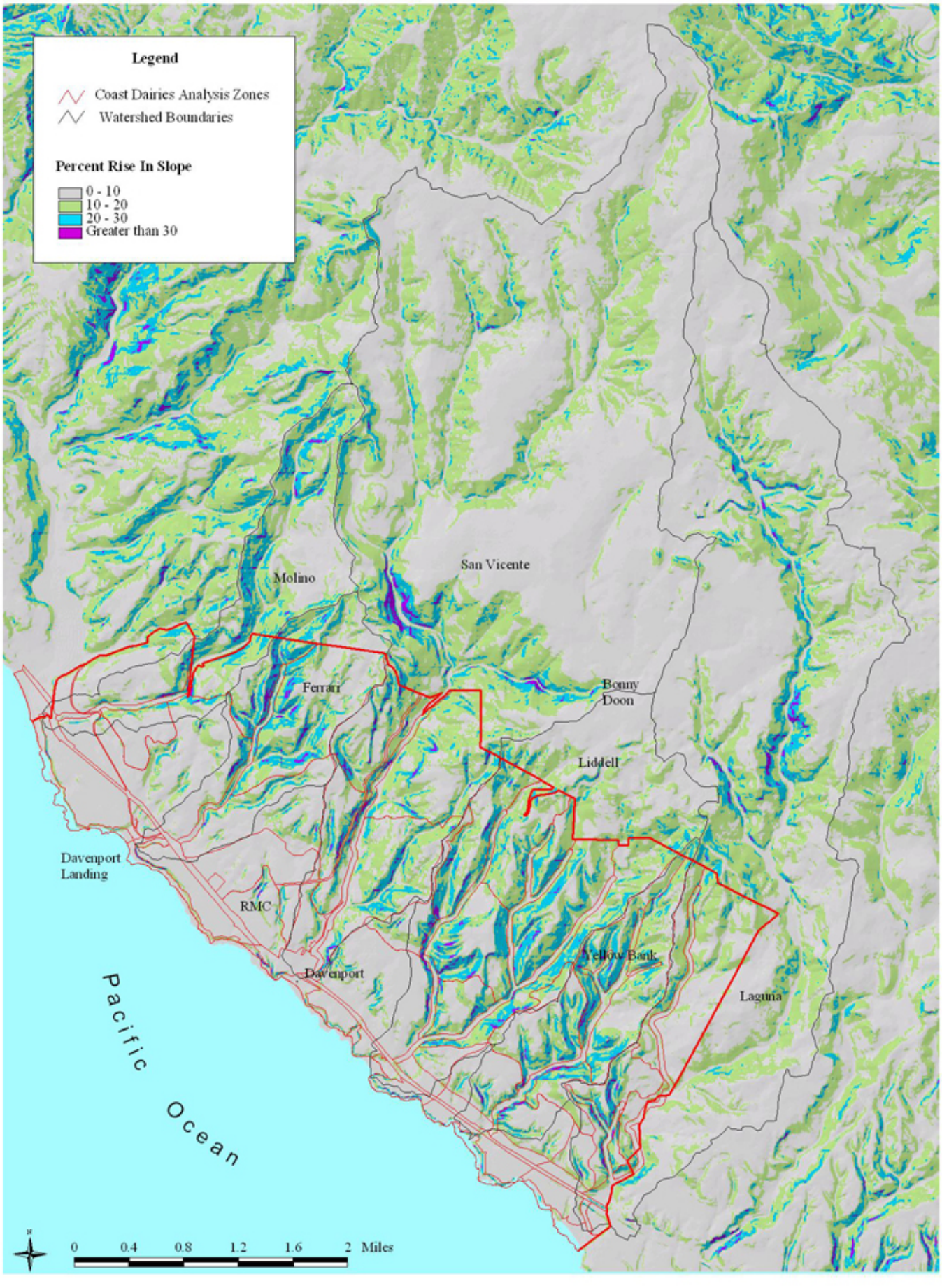
Only the regression of all bankfull indicators gave an estimate of the bankfull discharge that was within the confidence band around the estimate of the 1.5-year discharge. The estimate of bankfull discharge derived from the bankfull indicators at the cross section were below the confidence band for the 1.5-year discharge.

Two factors may have played a role in this outcome. First, numerous hoof-prints from cattle on the banks made it very difficult to identify possible bankfull indicators. The second factor was that the discharge measurements were taken upstream of a constriction. Debris caught in the constriction may have created backwater, which may have effected the velocity of the highest measured discharge. In light of these factors, the estimated 1.5-year discharge was adopted as the bankfull discharge.

Turbidity and Suspended Sediment

Nine turbidity measurements were made; three at the same time that discharge measurements were made. The discharge for the other six turbidity measurements was estimated from the stage. Measured turbidity ranged from 1.6 NTU to 63.8 NTU. The following turbidity-discharge relationship was found by regression:

$$\text{Turbidity} = 11.408(\text{Discharge})^{1.0023} \qquad R^2 = 0.6006$$



SOURCE: Environmental Science Associates, Pacific Meridian Resources, USGS

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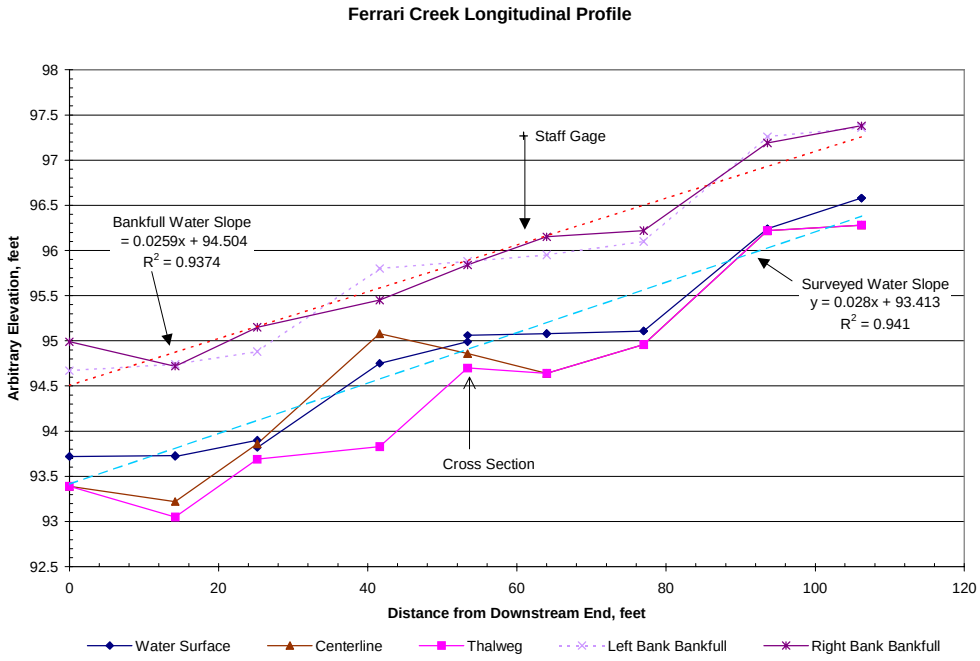
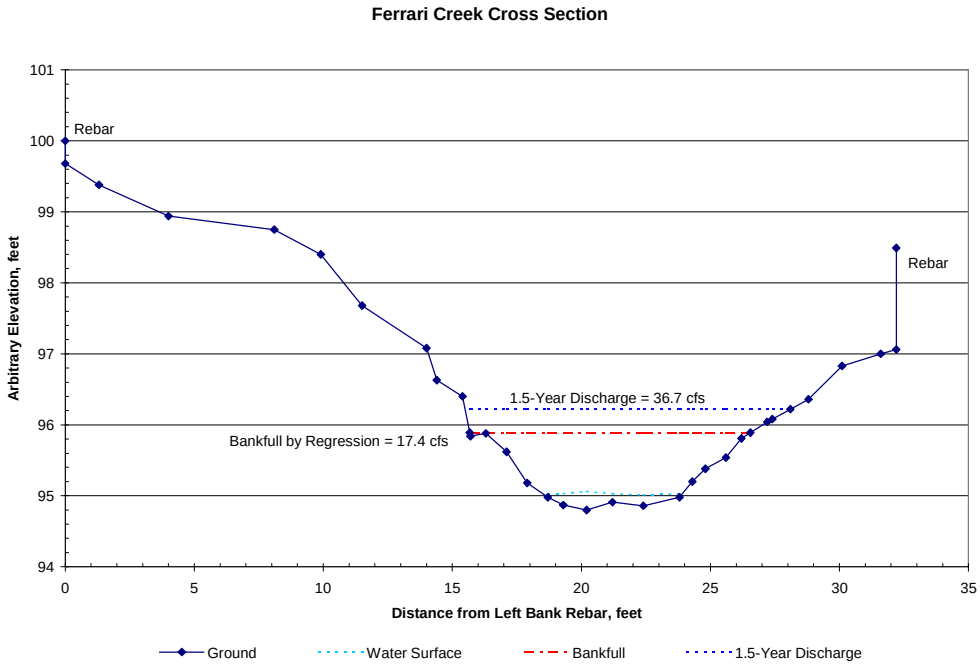
Figure 4.1-15

Slope Classifications of the Coast Dairies Area





Note: The upper graph shows the longitudinal profile for Ferrari Creek. The lower graph is a cross section.

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Figure 4.1-16
Longitudinal Profile and Cross Section for Ferrari Creek Monitoring Station

Six suspended sediment measurements were made but four of them were found to be below the no-detect limit. Since only two suspended sediment samples had values greater than the no-detect limit, the relationship between suspended sediment and discharge and between suspended sediment and turbidity should not be used. The relationships are shown here only for completeness.

$$\text{Suspended Sediment} = 16.66(\text{Discharge})^{-0.7014} \qquad R^2 = 1 \quad N = 2$$

The R^2 value of 1 is an artifact of having only two measurements and can not be interpreted as showing a strong relationship between suspended sediment and discharge.

Two measurements of suspended sediment and turbidity were available. A regression of suspended sediment versus turbidity gave the following equation.

$$\text{Suspended Sediment} = 0.1389(\text{Turbidity})^{1.4603} \qquad R^2 = 1 \quad N = 2$$

Again, the R^2 value of 1 is an artifact of having only two measurements and can not be interpreted as showing a strong relationship between suspended sediment and discharge.

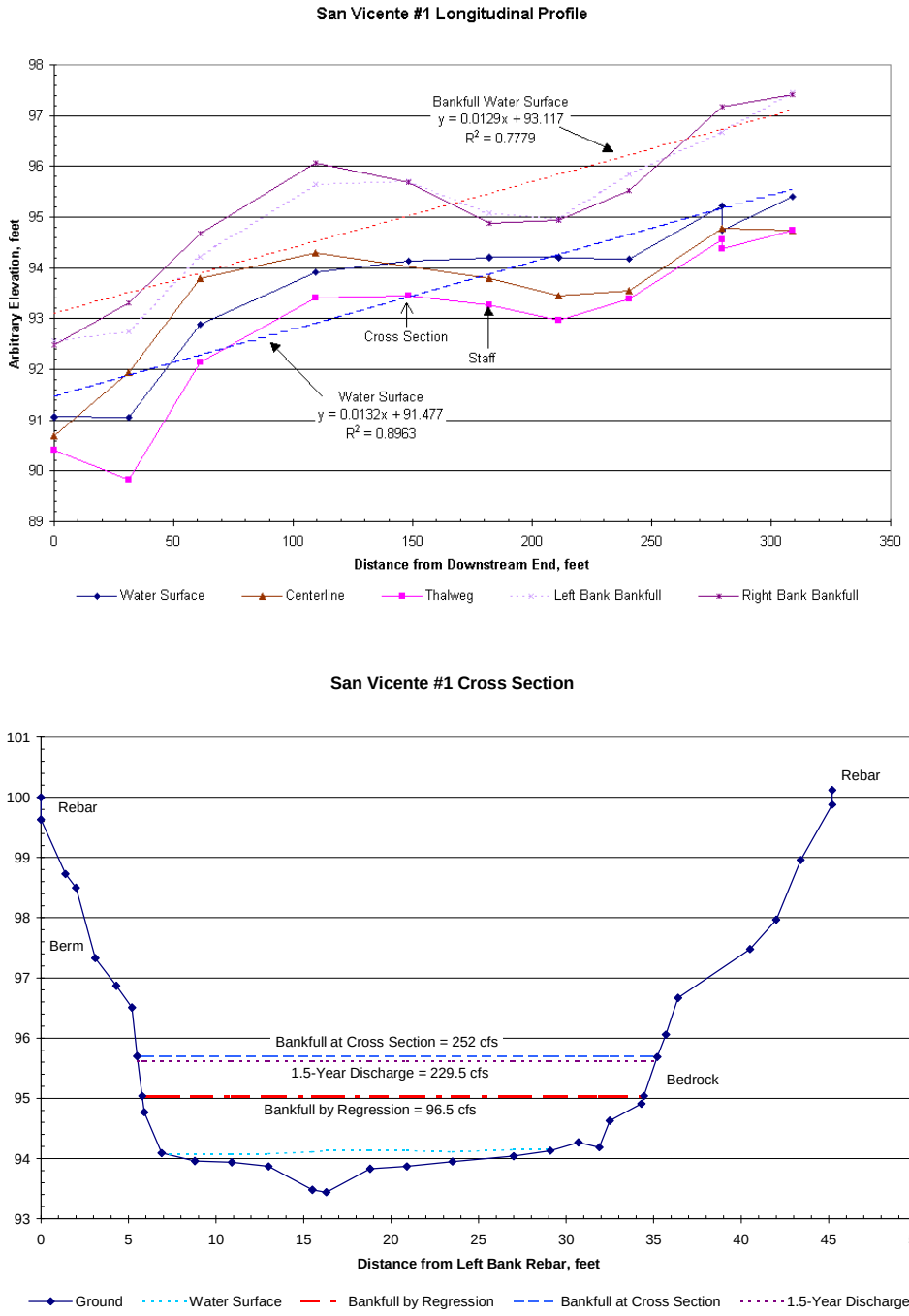
4.1.3.3 SAN VICENTE CREEK

For a general description of run-of-the-stream conditions, see Section 3.3.

San Vicente #1 (Lower)

The monitoring station on lower San Vicente Creek was located about 4,200 feet from the mouth of the creek in a reach of the creek adjacent to San Vicente Road. The channel was surveyed on December 5, 2000. The staff gauge was located in a large pool. A bedrock outcrop forms the west (right) bank of the gauging pool. The east bank of the channel at the cross section is a berm. The berm separates the channel from the site of an abandoned diversion facility. The cross section is about 34 feet downstream of the staff gauge. The cross section and longitudinal profile are shown in Figure 4.1-17.

The elevation of the monitoring station is about 50 feet. The watershed above the monitoring station covers about 10.49 square miles, with a maximum elevation of about 2,642 feet. Eighty-five percent of the watershed has an elevation of less than 1,960 feet. About 64 percent of the watershed is in the 0-10 percent slope class. Only about 5 percent of the watershed has slopes in excess of 20 percent.



Note: The upper graph shows the longitudinal profile for San Vicente Creek station #1. The lower graph shows San Vicente Creek in cross section at station #1.

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Figure 4.1-17
Longitudinal Profile and Cross Section for San Vicente Creek Monitoring Station #1

Approximately 61 percent of the watershed is underlain by quartzdiorite, a dense rock that is similar in chemical composition and appearance to granite. Only about 10 percent of the watershed is underlain by the Santa Cruz Mudstone. Therefore, most of the rocks transported by San Vicente Creek will have a density of close to that of solid rock. Consequently, eggs laid by salmonids will be less likely be washed away by flood events compared to eggs laid in a stream dominated by mudstone. In general, a watershed dominated by igneous or metamorphic rocks supplies bed material to its streams that are more suitable for salmonids than a watershed dominated by sedimentary rocks. About 23 percent of the watershed is covered by the Santa Margarita sandstone. However, most of the sandstone is located in the upper watershed on slopes less than 10 percent. The low slope of the Santa Margarita sandstone helps minimize its susceptibility to erosion.

The conveyor belt from the quarry to the cement plant crosses San Vicente Creek about 1,600 feet upstream of the monitoring station. Cows were frequently seen between the monitoring station and the conveyor belt. The cows have free access to the creek. A bridge spans the creek about 2,800 feet upstream of the monitoring station. There is a heavy vehicle stream crossing just downstream of the bridge. There is a staff gauge on the bridge and the remnant of a flow measurement weir at the bridge.

Continuous large slide complexes cover both sides of the San Vicente canyon above the bridge. The road that parallels the creek cuts across these slides.

Stage-Discharge Relationship

A total of four discharge measurements were made ranging from about 11 cfs to about 42 cfs. This corresponds to a range of 5 - 18 percent of the estimated 1.5-year discharge for the station. The discharge rating was determined to be:

$$\text{Discharge} = 2.3399\ (\text{Gauge Height})^{4.0955} \qquad R2 = 0.9997 \qquad N = 9$$

Bankfull Discharge

The extensive bedrock outcrop at the gauging pool made identifying bankfull indicators difficult. There was a good set of bankfull indicators at the cross section. The bankfull indicators at the cross section gave an estimate of about 252 cfs for the bankfull discharge. The bankfull level from the regression of all indicators gave an estimate of 96.5 cfs, which is less than the lower limit of the confidence band of the 1.5-year discharge. Thus, 252 cfs was adopted as the bankfull discharge.

Turbidity and Suspended Sediment

Nine turbidity measurements were made, three of them at the same time that discharge measurements were made. The discharge for the other six turbidity measurements was estimated from the stage. Measured turbidity ranged from 0.72 NTU to 26.2 NTU. The following turbidity-discharge relationship was found by regression.

$$\text{Turbidity} = 0.2136(\text{Discharge})^{1..3516} \qquad R^2 = 0.6799 \qquad N = 4$$

For these nine samples, discharge explains about 68 percent of the variation in the turbidity readings.

Nine suspended sediment measurements were made but five of them were found to be below the no-detect limit. The four suspended sediment samples with values greater than the 5 mg/l no-detect limit were used to estimate the relationship between suspended sediment and discharge.

$$\text{Suspended Sediment} = 25.648(\text{Discharge})^{-0.1817} \qquad R^2 = 0.0491 \qquad N = 4$$

The R^2 value of 0.0491 indicates that the four measurements show no relationship between suspended sediment and discharge. Typically, the relationship between suspended sediment and discharge on the rising limb of the hydrograph is different from the relationship on the falling limb. Since the Planning Team did not attempt to collect information regarding the point on the hydrograph at which samples were take, it is reasonable that no relationship was not observed.

Four paired measurements of suspended sediment and turbidity were available. A regression of suspended sediment versus turbidity gave the following equation.

$$\text{Suspended Sediment} = 0.5247(\text{Turbidity})^{1.1685} \qquad R^2 = 0.5607 \qquad N = 4$$

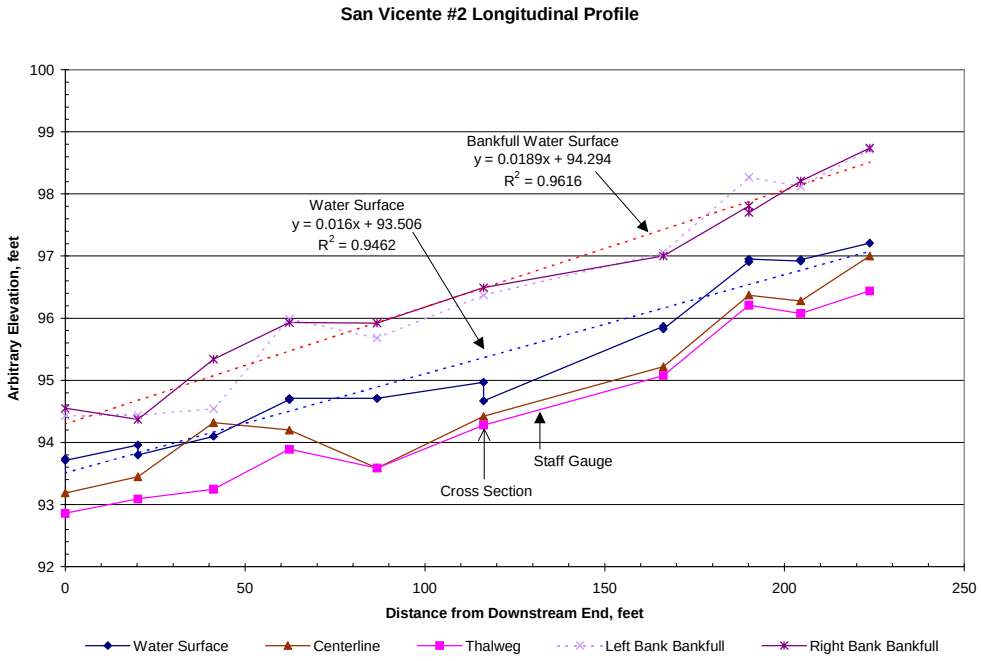
The R^2 value of 0.5607 shows that turbidity explains about 56 percent of the variation in the suspended sediment values, in these four measurements.

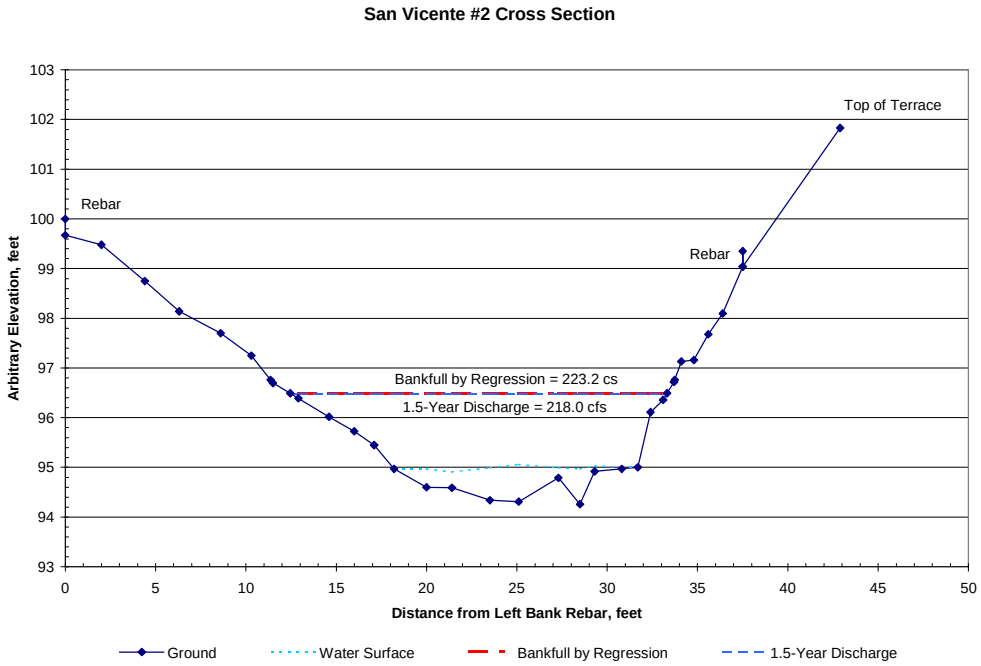
San Vicente #2 (Upper)

The upper monitoring station on San Vicente Creek was located about one mile upstream from the lower monitoring station, in the reach of creek adjacent to Upper San Vicente Road. The channel was surveyed on December 4, 2000. The staff gauge was located in a large pool. A group of alders and an undercut bank form the left edge of the gauging pool. The streambed is covered with granite boulders and large cobble. There is a deposit of sand on the bottom of the gauging pool. The cross section and longitudinal profile are shown in Figure 4.1-18.

The elevation of the monitoring station is about 145 feet. The watershed above the monitoring station covers about 9.89 square miles, with the highest elevation at about 2,642 feet. Eighty-five percent of the watershed has an elevation of less than 1,990 feet. About 65 percent of the watershed is in the 0-10 percent slope class; only about 5 percent has slopes in excess of 20 percent.

Approximately 65 percent of the watershed is underlain by quartzdiorite. Only about 5 percent of the watershed is underlain by the Santa Cruz Mudstone. Therefore, most of the rocks transported by San Vicente Creek will have a density of close to that of granite. About 25 percent of the watershed is covered by the Santa Margarita sandstone. However, most of the sandstone is located in the upper watershed on slopes less than 10 percent. The low slope of the Santa Margarita sandstone helps minimize its susceptibility to erosion.





Note: The upper graph shows the longitudinal profile for San Vicente Creek at station #2. The lower graph shows San Vicente Creek in cross section at station #2.

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Figure 4.1-18
Longitudinal Profile and Cross Section for
San Vicente Creek Monitoring Station #2

Stage-Discharge Relationship

A total of four discharge measurements were made ranging from about 10 cfs to about 41 cfs. This corresponds to a range of 5 - 19 percent of the estimated 1.5-year discharge for the station. Three of the discharge measurements were made in the tail-out of the gauging pool, just upstream of the cross section. The largest discharge was measured downstream on the riffle because a large portion of the flow was concentrated on the right-bank of the section where the other measurements were made.

The discharge rating based only on the discharge measurements appeared to underestimate the bankfull discharge. Therefore, the discharge rating was constrained by the cross section geometry from the survey. The discharge rating was determined to be:

$$\text{Discharge} = 2.7651\ (\text{Gauge Height})^{4.3099} \qquad R2 = 0.9997.$$

Bankfull Discharge

Both the regression of bankfull-indicators and the bankfull-indicators at the cross section give estimates of the bankfull discharge within the confidence band for the estimate of the 1.5-year discharge. The bankfull discharge based on the regression of all the bankfull indicators was the closest to the estimate for the 1.5-year discharge. Therefore, 223 cfs was adopted as the bankfull discharge.

Turbidity and Suspended Sediment

Nine turbidity measurements were made, three at the time that discharge measurements were made. The discharge for the other six turbidity measurements was estimated from the stage. Measured turbidity ranged from 1 NTU to 27.6 NTU. The following turbidity-discharge relationship was found by regression.

$$\text{Turbidity} = 0.2323(\text{Discharge})^{1..2868} \qquad R^2 = 0.5751 \qquad N = 9$$

For these nine samples, discharge explains about 58 percent of the variation in the turbidity readings.

Nine suspended sediment measurements were made but five of them were found to be below the no-detect limit. The four suspended sediment samples with values greater than the 5 mg/l no-detect limit were used to estimate the relationship between suspended sediment and discharge.

$$\text{Suspended Sediment} = 28.073(\text{Discharge})^{-0.1692} \qquad R^2 = 0.0453 \qquad N = 4$$

The R^2 value of 0.0453 indicates that the four measurements show no relationship between suspended sediment and discharge.

Four paired measurements of suspended sediment and turbidity were available. A regression of suspended sediment versus turbidity gave the following equation.

$$\text{Suspended Sediment} = 1.021(\text{Turbidity})^{1.0557} \qquad R^2 = 0.9508 \qquad N = 4$$

The R^2 value of 0.9508 shows that turbidity explains about 95 percent of the variation in the suspended sediment values in these four measurements.

4.1.3.4 LIDDELL CREEK

For a general description of run-of-the-stream conditions, see Section 3.3.

Liddell #1 (West Liddell Creek)

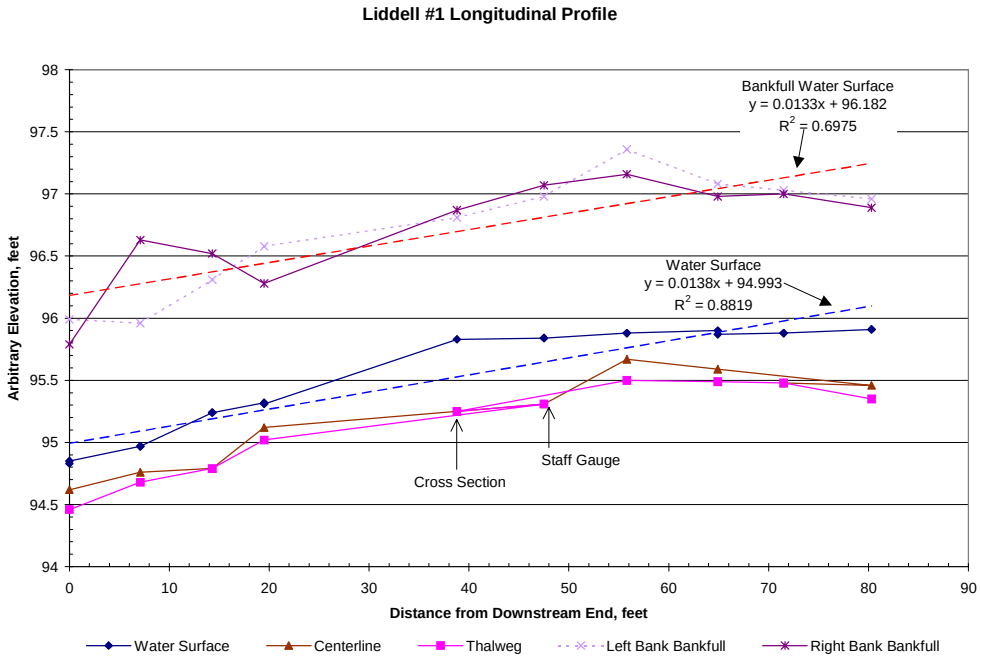
The Liddell #1 monitoring station is on West Liddell Creek, about 190 feet upstream of its confluence with Liddell Creek. The road that parallels Liddell Creek crosses West Liddell at the monitoring station. The start of the surveyed section is about 20 feet downstream of the bridge, ant the staff gauge is about 17 feet upstream of the bridge; the cross section is about midway between the bridge and the staff gauge. The cross section and longitudinal profile are shown in Figure 4.1-19. The channel was surveyed on December 5, 2000. The elevation of the monitoring station is about 40 feet.

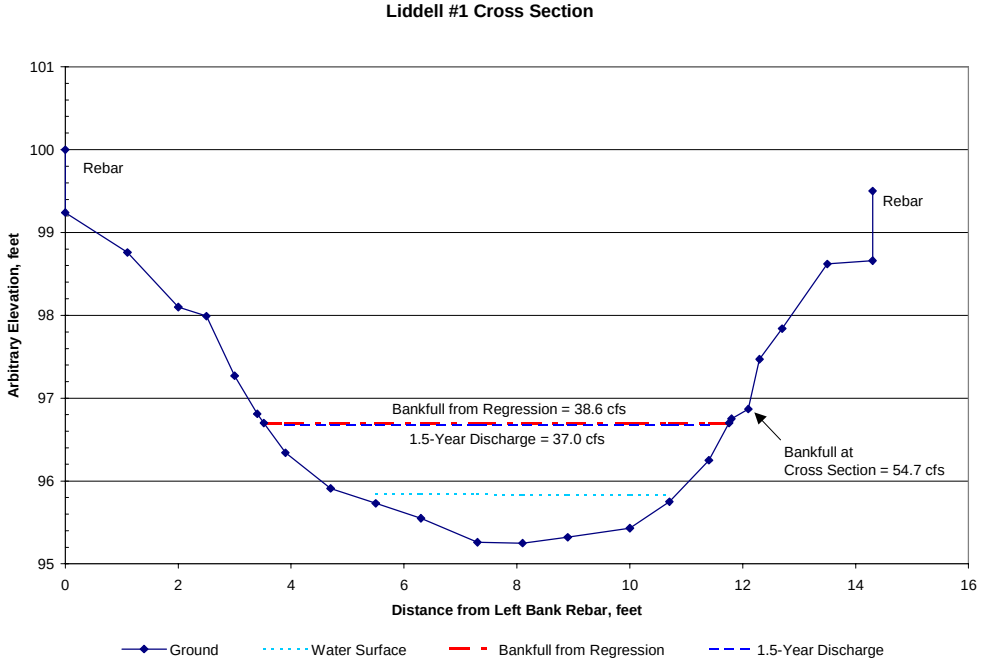
The banks of the stream are made of fine-grained material. The bed of the stream is covered by cobbles (2.5" to 10" in diameter) and a few small boulders (>10" in diameter).

The watershed area above the monitoring station encompasses about 1.29 square miles. The highest point in the watershed has an elevation of about 1,300 feet. Eight-five percent of the watershed has an elevation less than 660 feet. About 48 percent of the watershed is in the 0-10 percent slope class. Slightly more than 18 percent of the watershed has slopes greater than 20 percent.

The Santa Cruz Mudstone formation underlies about 58 percent of the watershed, and quartz diorite about 16 percent. The bed material in West Liddell Creek can therefore be expected be a mixture of normal rocks derived from the quartz diorite, and density rocks derived from the Santa Cruz Mudstone.

The Santa Margarita Sandstone formation covers about 14 percent of the watershed. Most of the sandstone is on the top of the ridge and is in the 0-10 percent slope class. However, a ribbon of sandstone crosses West Liddell Creek in the vicinity of the conveyor belt. A ribbon of sandstone follows the creek for about 1,600 feet and joins the ribbon that crosses the creek at about the conveyor. The Santa Margarita Sandstone is highly erosive if disturbed, and breaks down quickly into sand. The exposure of sandstone along the creek can be expected to contribute some sand to the stream. However, most of the Santa Margarita is away from the stream on the ridges and has a low slope so may not contribute much sand to the creek.





Note: The upper graph shows the longitudinal profile for Liddell Creek at station #1. The lower graph shows Liddell Creek in cross section at station #1.

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Figure 4.1-19
Longitudinal Profile and Cross Section for
Liddell Creek Monitoring Station #1

The conveyor belt crosses West Liddell Creek about 1.96 miles upstream of the monitoring station. Bonny Doon road parallels West Liddell Creek, and crosses the only large slide complex in the watershed.

Stage-Discharge Relationship

A total of four discharge measurements were made at Liddell #1 monitoring station, ranging from about 1.7 cfs to about 5.5 cfs. This corresponds to a range of 4 - 15 percent of the estimated 1.5-year discharge for the station. The discharge rating was determined to be:

$$\text{Discharge} = 2.4713\ (\text{Gauge Height})^{4.5997} \qquad R2 = 0.9813$$

Bankfull Discharge

Both the regression of bankfull-indicators and the bankfull-indicators at the cross section give estimates of the bankfull discharge within the confidence band for the estimate of the 1.5-year discharge. The bankfull discharge based on the regression of all the bankfull indicators was the closest to the estimate for the 1.5-year discharge. Therefore, 38.8 cfs was adopted as the bankfull discharge.

Turbidity and Suspended Sediment

Nine turbidity samples were taken and analyzed, three at the same time that discharge measurements were made. The discharge for the other six turbidity measurements was estimated from the stage. Measured turbidity ranged from 1.36 NTU to 186 NTU. The following turbidity-discharge relationship was found by regression.

$$\text{Turbidity} = 6.0506(\text{Discharge})^{1.7637} \qquad R^2 = 0.6061 \qquad N = 9$$

For these nine samples, discharge explains about 60 percent of the variation in the turbidity readings.

Nine suspended sediment measurements were made but three of them were found to be below the no-detect limit. The six suspended sediment samples with values greater than the 5 mg/l no-detect limit were used to estimate the relationship between suspended sediment and discharge

$$\text{Suspended Sediment} = 8.9471(\text{Discharge})^{0.6848} \qquad R^2 = 0.1127 \qquad N = 6$$

The R^2 value of 0.1127 indicates that the six measurements show no relationship between suspended sediment and discharge.

Six paired measurements of suspended sediment and turbidity were available. A regression of suspended sediment versus turbidity gave the following equation.

$$\text{Suspended Sediment} = 0.7623(\text{Turbidity})^{0.8642} \qquad R^2 = 0.7768 \qquad N = 6$$

The R^2 value of 0.7768 shows that turbidity explains about 78 percent of the variation in the suspended sediment values, in these six measurements.

Liddell #2 (Liddell Creek)

The monitoring station on Liddell Creek is located about 1,300 feet upstream of the confluence with West Liddell Creek. The channel was surveyed on December 7, 2000. The cross section and longitudinal profile are shown in Figure 4.1-20.

The elevation of the monitoring station is about 57 feet. The highest point in the watershed has an elevation of 1,299 feet. The west flank of Bald Mountain (1,296 feet) is included in the watershed. Eighty-five percent of the watershed has an elevation of less than 1,120 feet. The watershed above the monitoring station has an area of about 1.90 square miles. About 39 percent of the watershed area is in the 0-10 percent slope class, and about 19 percent of the area has slope in excess of 20 percent.

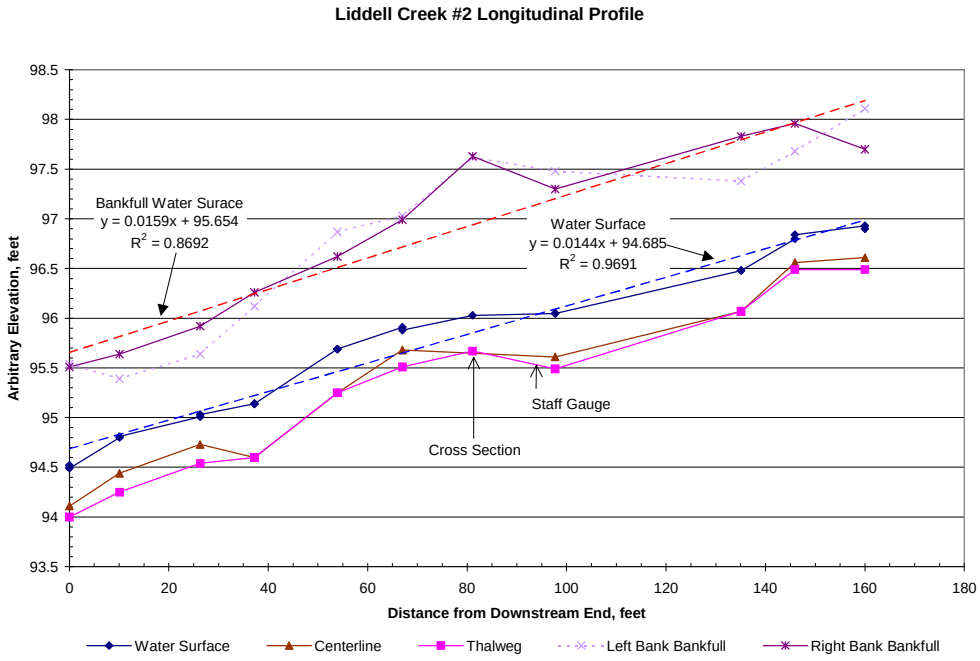
The Santa Cruz Mudstone formation covers about 48 percent of the watershed. The Santa Margarita sandstone covers about 26 percent of the watershed. Outcrops of Marble cover about 11 percent of the watershed, and is mined by RMC Pacific Materials. Quartz diorite covers about 6 percent of the watershed.

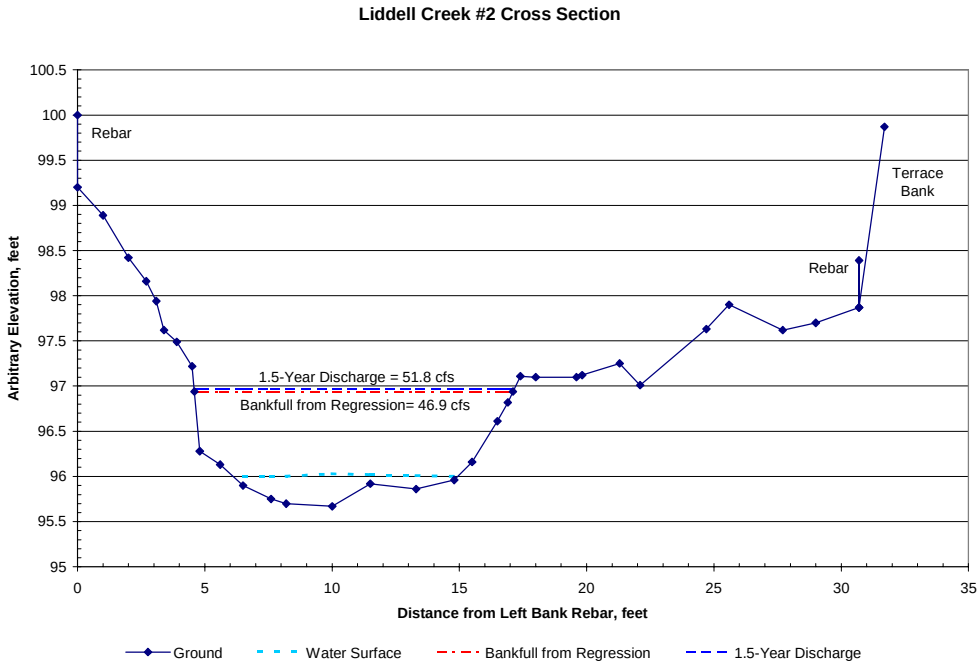
The Santa Margarita sandstone is concentrated in the East Branch of Liddell Creek. The sandstone is located on both sides of the upper East Branch watershed and on the valley bottom. The road that parallels the creek cuts through the sandstone. There are several locations where the roadside ditch is loaded with sand and there are san deposits on the road. It appears, therefore, that the sandstone is contributing a large sediment load to the creek.

As Liddell Pipeline Road climbs out of the East Branch drainage en route to Yellow Bank Creek and Y Creek, it crosses an area underlain by the Santa Margarita Sandstone. Although this road is extremely steep, it is constructed with frequent, deep waterbars that tend to direct runoff and any sediment that it is carrying onto the hillslope well away from the creek (see Roads in Section 4.2).

The marble quarry runoff is routed through two sediment detention basins in the upper East Branch watershed. The upper basin is much larger than the lower basin. The lower basin partially failed in the winter of 1999- 2000. It was reported to have failed again in March 2001. There is also an overburden dump in the upper Liddell Creek watershed, with a sediment basin below it. These sediment basins are located in the swales that form the headwaters of Liddell Creek and East Branch Liddell Creek. The beds of the creeks below the sediment basins are both filled with fine sediment, presumably from the sediment basins' failure or poor performance.

There is a large slide complex at the confluence of the East Branch and the mainstem of Liddell Creek. The creek cuts through the base of the slide complex on the east side of the creek. The road cuts through the base of the slide on the west side of the creek. Cattle graze in the watershed above the monitoring station, and the City of Santa Cruz obtains water from a large spring adjacent to the marble quarry.





Note: The upper graph shows the longitudinal profile for Liddell Creek at station #2. The lower graph shows Liddell Creek in cross section at station #2.

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Figure 4.1-20
Longitudinal Profile and Cross Section for
Liddell Creek Monitoring Station #2

Stage-Discharge Relationship

A total of four discharge measurements were made ranging from about 1.8 cfs to about 6.3 cfs. This corresponds to a range of 3 - 12 percent of the estimated 1.5-year discharge for the station. A small rock wall was constructed below the measurement point to provide sufficient depth for the first measurement.

The discharge rating based only on the actual discharge measurements gave extremely high estimates of the discharge near bankfull. Therefore, the survey data were used to constrain the relationship between discharge and stage at higher flows. The discharge rating was determined to be:

$$\text{Discharge} = 0.3809\ (\text{Gauge Height})^{6.4043}$$

Bankfull Discharge

Only the regression of bankfull-indicators gave an estimate of the bankfull discharge within the confidence band for the estimate of the 1.5-year discharge. Therefore, 46.9 cfs was adopted as the bankfull discharge.

Turbidity and Suspended Sediment

Nine turbidity measurements were made, three when discharge measurements were also made. The discharge for the other six turbidity measurements was estimated from the stage. Measured turbidity ranged from 1.4 NTU to 113 NTU. The following turbidity-discharge relationship was found by regression.

$$\text{Turbidity} = 6.2376(\text{Discharge})^{1.5425} \qquad R^2 = 0.6566 \qquad N = 9$$

For these nine samples, discharge explains about 66 percent of the variation in the turbidity readings.

Nine suspended sediment measurements were made but three of them were found to be below the no-detect limit. The six suspended sediment samples with values greater than the 5 mg/l no-detect limit were used to estimate the relationship between suspended sediment and discharge

$$\text{Suspended Sediment} = 23.974(\text{Discharge})^{0.2859} \qquad R^2 = 0.0169 \qquad N = 6$$

The R^2 value of 0.0169 indicates that the six measurements show no relationship between suspended sediment and discharge.

Four paired measurements of suspended sediment and turbidity were available. A regression of suspended sediment versus turbidity gave the following equation.

$$\text{Suspended Sediment} = 0.3941(\text{Turbidity})^{1.1935} \qquad R^2 = 0.8919 \qquad N = 6$$

The R^2 value of 0.8919 shows that turbidity explains about 89 percent of the variation in the suspended sediment values in these six measurements.

4.1.3.5 YELLOW BANK CREEK

For a general description of run-of-the-stream conditions, see Section 3.3.

The monitoring station on Yellow Bank Creek is located just downstream of a failed road crossing about 1.15 miles (6,100 feet) above the reservoir near Highway 1. The channel was surveyed on December 11, 2000. The staff gauge was placed in a pool just below the road crossing. A cross section was surveyed across the riffle crest about 14.4 feet downstream of the staff gauge. The cross section and longitudinal profile are shown in Figure 4.1-21.

The watershed above the monitoring station encompasses about 0.60 square miles. The 1.5-year discharge is estimated to be 19.1 cfs. The elevation of the monitoring station is about 160 feet above sea level. Eighty-five percent of the watershed is below 660 feet in elevation. Bald Mountain (1,296') is the highest point in the watershed.

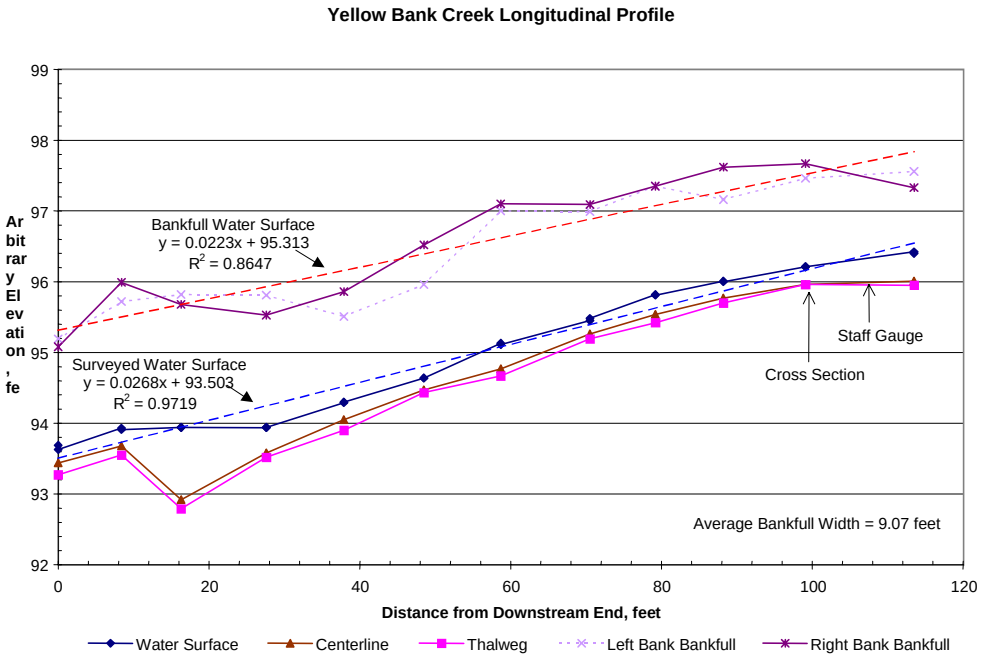
About 33 percent of the watershed area above the monitoring station consists of slopes in the 0-10 percent range. About 22 percent of the watershed has slopes in excess of 20 percent. Only Ferrari Creek has a higher percentage of land with slopes in excess of 20 percent.

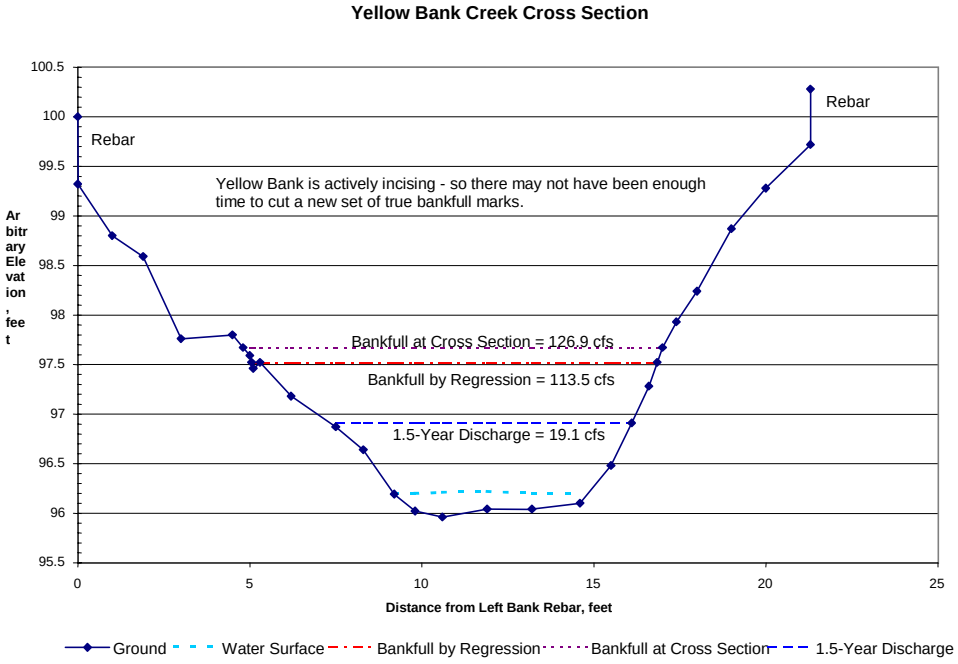
The Santa Cruz Mudstone formation underlies about 84 percent of the watershed above the monitoring station. Thus, the bed material in the creek will tend to have a low density and will move at lower discharges than similar sized material made of granite or quartzdiorite. About 13 percent of the watershed is underlain by the Santa Margarita Sandstone. All of the Santa Margarita Sandstone in the watershed is located above Liddell Pipeline Road. The stream channel traverses most of the length of the outcrop of Santa Margarita Sandstone. Therefore, the portion of Yellow Bank Creek above the pipeline road is very sensitive to disturbance.

The monitoring station is located adjacent to the largest landslide in the watershed.

Channel Incision

At the washed-out road crossing near the Yellow Bank Creek monitoring station, the culvert for the crossing is still in place, but it is no longer functioning. The stream has cut a path around the right side (looking downstream) of the culvert. Upstream of the crossing, the creek banks are collapsing. The base of a group of large alders (diameter > 24") has slid into the creek and the trees on the opposite bank are leaning over the channel. The channel at this point is a narrow slot with high banks. About 1,300 feet upstream of the monitoring station there is a set of nickpoints in the channel. The largest is about three feet high and the other two are each about a foot high. The nickpoint furthest upstream is only about 100 feet below the City of Santa Cruz's pipeline from Liddell Spring. The channel above the nickpoint has low banks and the bed of the channel is vegetated.





Note: The upper graph shows the longitudinal profile for Yellow Bank Creek. The lower graph shows Yellow Bank Creek in cross section.

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Figure 4.1-21
Longitudinal Profile and Cross Section for
Yellow Bank Creek Monitoring Station

The monitoring station is located just downstream of the washed-out road crossing. The staff gauge is in a pool directly below the culvert. The surveyed section of creek extends downstream about 114 feet. The surveyed section encompasses two sharp turns. Below the second bend, the channel is a narrow slot with dramatically undercut banks, suggesting incision has occurred in this section as well.

Inspection of the channel near the reservoir also revealed signs of channel incision. The first signs of incision were encountered a few hundred feet upstream of the reservoir, approximately near the point where the 60-foot-contour interval crosses the stream on the topographic map. The channel had a slot-like character and there were several leaning trees. Only a few hundred feet of channel were inspected near the reservoir.

The reservoir dam blew out in February of 1998. Figure 4.1-3 shows that the 1998 February rainfall (18.63") was the highest recorded February in Santa Cruz (1905 to 2000). Figure 4.1-2 shows that 1998 had the highest total precipitation for January and February (34.21") for the period of record. It is not known if Yellow Bank Creek was actively incising prior to the intense rainfall of 1998 or if the 1998 rainfall coupled with the lowering of the water behind the failed dam triggered the incision.

Neither could the Planning Team discern whether the road crossing at the monitoring station failed in 1998 or before. Bern Smith, Coast Dairies Property Manager, says that it had already failed before his first visit to the area. However, the rainfall record suggests that February 1998 is the time when the culvert was most likely to fail. It is possible that the intense rainfall of 1998 produced large magnitude runoff events. The USGS gauging station on Pescadero Creek recorded the largest flood of 1998 on February 3 with a return period (Gumbel Extreme value) of about 66 years. The USGS gauge at Big Trees on the San Lorenzo River also reported the largest flood event for 1998 on February 3. However, the return period of the February 3 event on the San Lorenzo River was only about 15 years. So the Pescadero flood record supports the occurrence of a large magnitude flood event in February 1998 but the San Lorenzo flood record suggests only a moderate event occurred. Of course, the high intensity rainfall cells that produced the record rainfall in Santa Cruz and that generated a 66-year-return-period flood in Pescadero Creek may have been confined to the coastal region.

The culvert in the road crossing was much too small to accommodate the large magnitude of flow. So, the road fill acted like a dam and eventually failed.

The three observed nickpoints are vertical drops. Planning Team hydrologist Dennis Jackson and geologist Peter Hudson examined this nickpoint. The nickpoint is cutting through cohesive material. The face of the nickpoint is concave and the back wall is recessed about eighteen inches from the lip. The lower face was damp. It is likely that the pressure of water seeping out of the face of the nickpoint is the principle mechanism causing the nickpoint to migrate upstream. The water falling over the lip removes the debris from the base of the nickpoint. In addition, the falling water contributes to the erosion of the face. The removal of the sloughed debris prevents sufficient material from accumulating at the base to support the collapsing face.

It is likely that the maximum rate of upstream migration of the nickpoint occurs after a flood event. During the flood, the soil on the lower face of the nickpoint may become saturated but the water in the channel probably supports the face of the nickpoint. After the water level recedes, the water flowing out of the saturated face causes it to collapse. Subsurface flow moving into the channel also contributes to saturating the face of the nickpoint.

The mechanism that caused the creation of the nickpoint on Yellow Bank Creek is not known. Regardless of the mechanism that generated the incision, the nickpoint is now only about 100 feet downstream of the City of Santa Cruz's water supply pipeline. It is possible that the nickpoint could migrate past the pipeline after a single large storm event. The pipeline is simply laid across the ground with no additional supports at the stream crossings. This simple crossing is reasonable since the channel is very small and well-vegetated at the crossing. However, the migration of the nickpoint past the pipeline crossing will erode the streambed away and leave the pipeline suspended about five feet in the air.

The pipeline crossing is only a short distance below Liddell Pipeline Road. A short distance above the road crossing there is an outcrop of the highly erosive Santa Margarita Sandstone along the streambed of upper Yellow Bank Creek. If the nickpoint migrates past the pipeline and road crossing it will probably enter the Santa Margarita Sandstone. There is a strong potential that the nickpoint will rapidly migrate up through the Santa Margarita Sandstone. The disturbance from the migrating nickpoint might cause the Santa Margarita Sandstone to deliver a large load of sand to the creek. The sand will eventually be transported down to the reservoir.

The incision process has apparently already delivered a substantial load of sediment to the reservoir. Inspection of the streambed near the reservoir revealed that the incision began some distance upstream of the reservoir. It is estimated that the incision begins somewhere near the point where the 60-foot-contour interval crosses the creek on the map. The distance up the channel to the nickpoint is approximately 6,900 feet. The nickpoint at the upstream end is about five feet high. The incision near the reservoir is zero; thus the average incision is about 2.5 feet. The width of the channel bottom at the monitoring station is about five feet, and, assuming that the average channel width is five feet, a rough estimate of the total volume of material eroded by the incision process so far is 6,900 feet x 2.5 feet x 5 feet = 86,250 cubic feet or 3,194 cubic yards, or 1.98 acre-feet.

The channel is in the process of adjusting to the passage of the nickpoint. The oversteepened banks can be expected to collapse into the channel. The material from the collapsed banks will eventually be transported down to the reservoir. This process will probably take from several years to several decades depending on the frequency of storm events large enough to transport the material. Thus, the rate of sedimentation in the reservoir will probably be well above historical rates for years to come.

Stabilizing the nickpoint, before it reaches the City's pipeline must be given the highest priority (see Section 4.2.5). The passage of the nickpoint may damage the City's pipeline and the road. If the nickpoint reaches the Santa Margarita Sandstone, it is possible that a significant amount of

sand will be delivered to the creek. Stabilizing the nickpoint at its current location will limit the amount of channel bed erosion that will eventually be transported to the reservoir.

It is strongly recommend that the 1,400 feet of stream channel between the pipeline and the monitoring station be checked to determine if additional nickpoints are present. If additional nickpoints are present, there is the potential that they could migrate upstream and undermine any attempts to stabilize the set of nickpoints near the pipeline. Similarly, the mile of stream channel between the reservoir and the monitoring station should be checked to determine if additional nickpoints are present.

Stage-Discharge Relationship

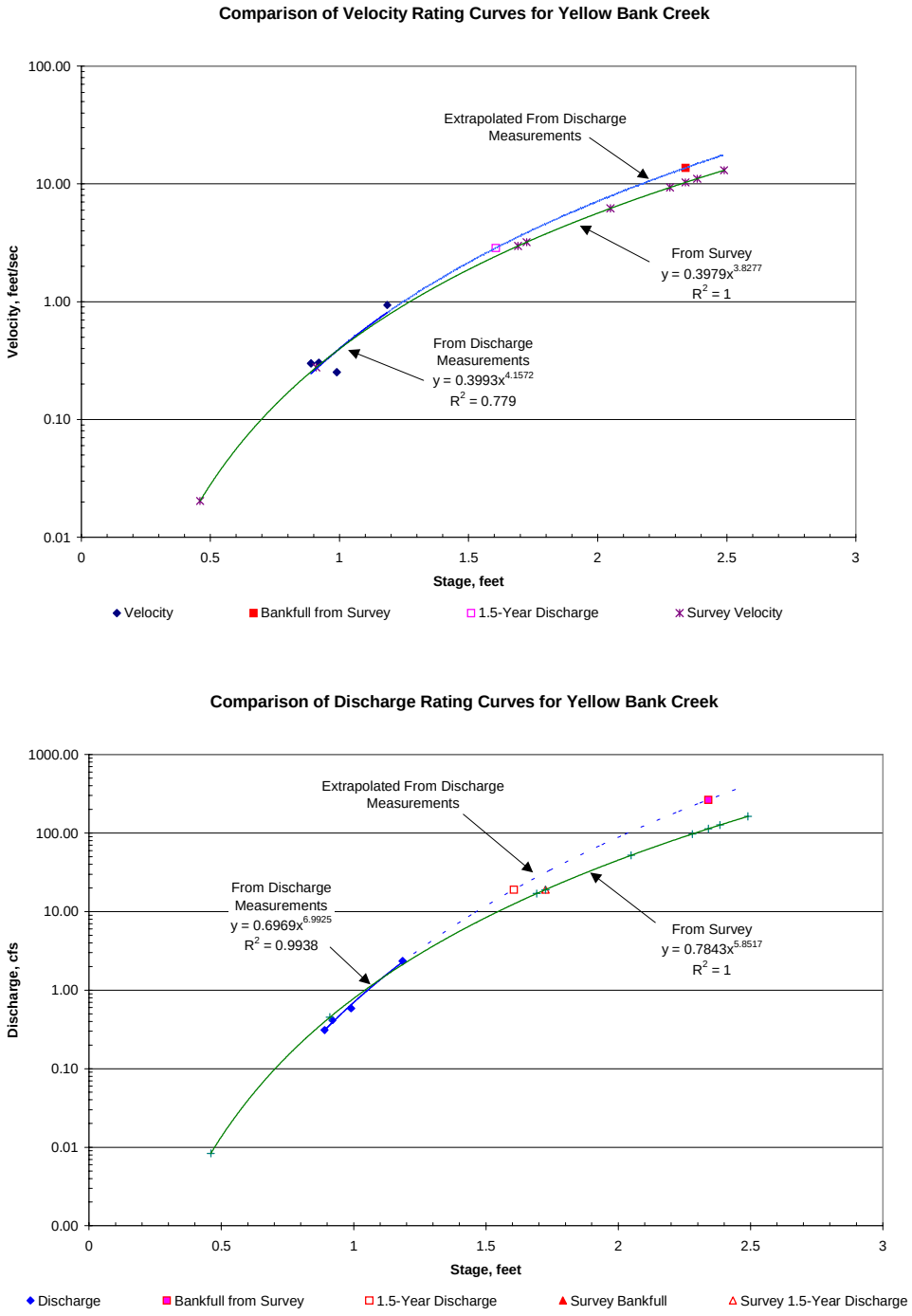
Four discharge measurements were made at the Yellow Bank Creek monitoring station. Measured discharges ranged from 0.31 cfs to 2.35 cfs or 1.6% - 12.3 percent of the estimated 1.5-year discharge. The discharge-rating curve developed from the four discharge measurements appeared to give unrealistic values for the discharge and velocity for large flows. Therefore, the survey data were used to constrain the discharge rating.

The survey data were input into the WinXSPRO computer program to analyze the cross section geometry. The survey data indicated that a change in the relationship between the cross section geometry and stage changed at 1.54 and again at 2.74 feet. Figure 4.1-22 compares the relationship of velocity-stage relationship developed from the discharge measurements to the relationship based on the survey data and the Manning equation. Figure 4.1-22 also compares the relationship of discharge-stage relationship developed from the discharge measurements to the relationship based on the survey data and the Manning equation. The discharge-rating curve, constrained by stage is: discharge = $0.7843(\text{Gauge Height})^{5.8517}$.

Bankfull Discharge

The bankfull discharge estimated from the indicators at the cross section and the estimate based on the regression of all the indicators in the surveyed reach turned out to be about six times larger than the estimated 1.5-year discharge. Since Yellow Bank Creek appears to be actively incising, it is possible that there has not been sufficient time for new bankfull indicators to develop. The obvious bankfull indicators that are visible probably represent the pre-incision bankfull level.

Since it appeared that good bankfull indicators have not yet been established for the present stream configuration, the estimated 1.5-year discharge (19.1 cfs) was adopted as the bankfull discharge.



Note: The upper graph compares the velocity rating based on the discharge measurements and the velocity rating developed from the flow resistance equation and the survey for Yellow Bank Creek. The lower graph compares the discharge rating based only the discharge rating for Yellow Bank Creek.

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Figure 4.1-22
Comparison of Velocity and Discharge Ratings for Yellow Bank Creek

Turbidity and Suspended Sediment

Seven turbidity measurements were made. Three of the turbidity measurements were made when the discharge measurements used to define the rating curve were made. The discharge for the other four turbidity measurements was estimated from the staff gauge reading. The turbidity measurements were made during discharges ranging from 1.6 percent of the 1.5-year discharge to 12.3 percent of the 1.5-year discharge. A regression of turbidity against discharge yielded the following relationship.

$$\text{Turbidity} = 37.3(\text{Discharge})^{1.1319} \qquad R^2 = 0.3849$$

The Yellow Bank turbidity-discharge relationship had the weakest R^2 value of all the stations. Five of the turbidity measurements were taken when the discharge was less than 3 percent of the 1.5-year discharge. The Yellow Bank monitoring station is the most remote station that was monitored. It also has the smallest watershed, which implies that its peak discharges will last for only a short amount of time. These factors suggest that if future stream monitoring is done a stage recorder and continuous turbidity monitor should be used at the Yellow Bank Creek monitoring station, or that the station should be re-located to a downstream location, perhaps just above the reservoir.

Six suspended sediment measurements were made, but four of them were found to be below the no-detect limit. Since only two suspended sediment samples had values greater than the no-detect limit, the relationship between suspended sediment and discharge and between suspended sediment and turbidity should not be used. The relationships are shown here only for completeness.

$$\text{Suspended Sediment} = 13.883(\text{Discharge})^{-0.166} \qquad R^2 = 1 \quad N = 2$$

The R^2 value of 1 is an artifact of having only two measurements and can not be interpreted as showing a strong relationship between suspended sediment and discharge.

Two measurements of suspended sediment and turbidity were available. A regression of suspended sediment versus turbidity gave the following equation.

$$\text{Suspended Sediment} = 1.8619(\text{Turbidity})^{0.5258} \qquad R^2 = 1 \quad N = 2$$

Again, the R^2 value of 1 is an artifact of having only two measurements and can not be interpreted as showing a strong relationship between suspended sediment and discharge

4.1.3.6 LAGUNA CREEK

For a general description of run-of-the-stream conditions, see Section 3.3.

Laguna Creek

Most of the Laguna Creek watershed is outside the Coast Dairies Property. The monitoring station is located about 600 feet upstream of old Highway 1. The channel was surveyed on December 7, 2000. The cross section and longitudinal profile are shown in Figure 4.1-23.

The watershed area above the monitoring station is about 7.60 square miles. The elevation of the monitoring station is about 20 feet. The elevation of the highest point in the watershed is about 2,400 feet. Eighty-five percent of the watershed has an elevation of less than 1,610 feet (Figure 4.1-1). About 65 percent of the watershed is in the 0-10 percent slope class. About 6 percent of the watershed has slopes in excess of 20 percent (Figure 4.1-15).

The Laguna Creek watershed has the most geologic diversity of the all the monitored watersheds (see Figure 4.2-2 in the next section of this report). Granite covers about 11 percent of the watershed. Schist covers about 32 percent of the watershed. The schist was formed by the metamorphism of siltstones and sandy mudstones, and contains large amounts of mica. The schist is deeply weathered. The rock is dense but is cut by fractures and joint planes. Clayey seams have developed along the fractures. Rocks of schist that make it to the streambed should have a density similar to solid rock.

Stage-Discharge Relationship

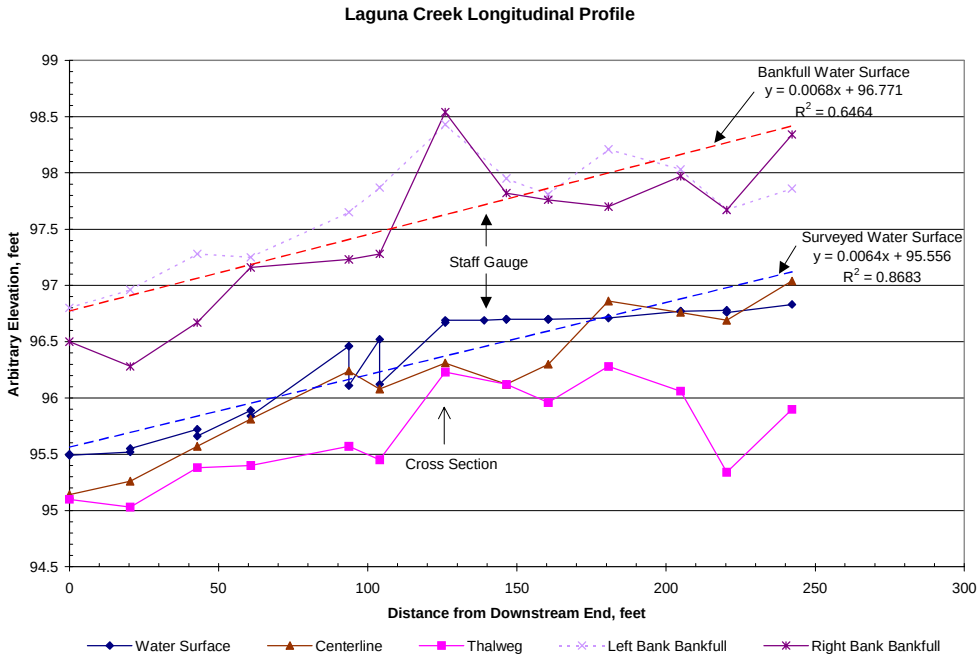
A total of four discharge measurements were made ranging from about 5.75 cfs to about 22.15 cfs. This corresponds to a range of 3% - 13 percent of the estimated 1.5-year discharge for the station.

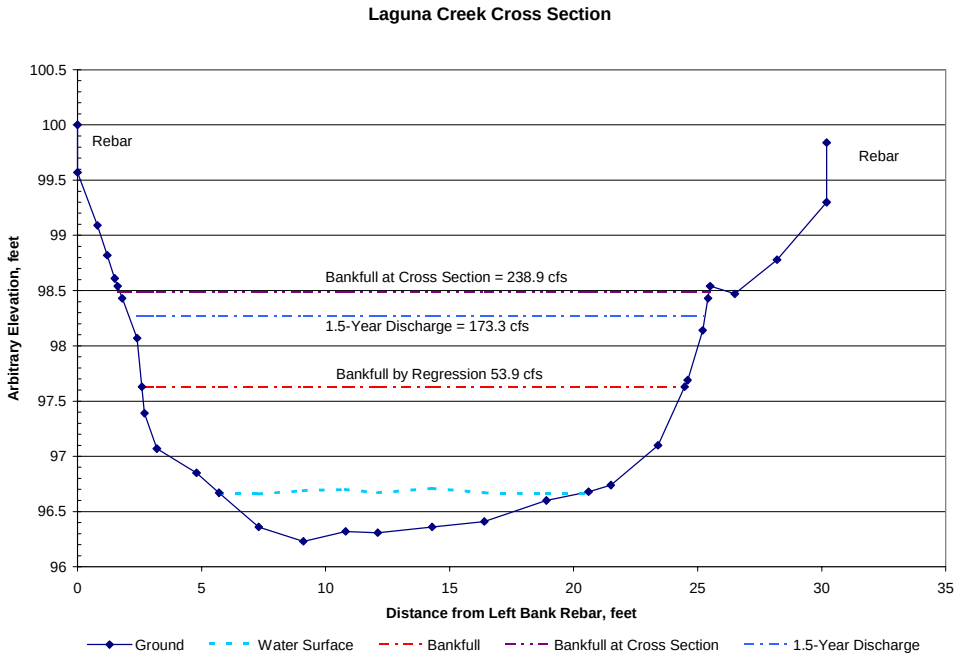
The discharge rating was determined to be:

$$\text{Discharge} = 7.4527\ (\text{Gauge Height})^{3.6488} \qquad R^2 = 0.9996$$

Bankfull Discharge

Only the bankfull-indicators at the cross section gave an estimate of the bankfull discharge within the confidence band for the estimate of the 1.5-year discharge. The bankfull indicators on both banks were close so the associated discharge was averaged to give the bankfull discharge of 238.9 cfs.





Note: The upper graph shows the longitudinal profile for Laguna Creek. The lower graph shows Laguna Creek in cross section.

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Figure 4.1-23
Longitudinal Profile and Cross Section for
Laguna Creek Monitoring Station

Turbidity and Suspended Sediment

The Planning Team collected and analyzed ten turbidity samples from the Laguna Creek station.. Four of the turbidity samples were taken at the same time as discharge measurements. The discharge for the other six turbidity measurements was estimated from the stage. Measured turbidity ranged from 1.21 NTU to 218 NTU, the highest turbidity measured at any of the stations. The following turbidity-discharge relationship was found by regression.

$$\text{Turbidity} = 2.3581(\text{Discharge})^{1.1033} \qquad R^2 = 0.7134 \qquad N = 10$$

For these nine samples, discharge explains about 71 percent of the variation in the turbidity readings.

Six suspended sediment measurements were made, but two of them were found to be below the no-detect limit. The four suspended sediment samples with values greater than the 5 mg/l no-detect limit were used to estimate the relationship between suspended sediment and discharge

$$\text{Suspended Sediment} = 1.8819(\text{Discharge})^{1.0198} \qquad R^2 = 0.5078 \qquad N = 4$$

The R^2 value of 0.5078 indicates that the discharge explains about 50 percent of the variation in the suspended sediment concentration for these four measurements.

Four paired measurements of suspended sediment and turbidity were available. A regression of suspended sediment versus turbidity gave the following equation.

$$\text{Suspended Sediment} = 0.8817(\text{Turbidity})^{0.8367} \qquad R^2 = 0.8687 \qquad N = 4$$

The R^2 value of 0.8687 shows that turbidity explains about 87 percent of the variation in the suspended sediment values in these six measurements.

Y Creek

Y Creek is the informal name for a tributary to Laguna Creek that flows through the southeastern part of the Property. One of the branches of the City of Santa Cruz's water supply lines crosses the creek and joins the other branch of the supply line on the east bank of the creek. The creek became know as Y Creek because the pipeline junction or "Y" is on its bank.

There is a bedrock cascade just downstream of the road crossing. This cascade is assumed to be a barrier to salmonid migration. The surveyed reach starts just upstream of the road crossing. The City of Santa Cruz replaced the culvert under in the summer of 2000, as the old culvert had washed out. The previous crossing was constructed using four separate culverts laid along side one another. The channel constriction at these culverts probably created a backwater area where sediment was deposited.

The Planning Team surveyed the Y Creek channel on December 11, 2000. The staff gauge was placed in a pool approximately 40 feet upstream of the road crossing. A cross section was

surveyed across the riffle crest about six feet downstream of the staff gauge. The cross section and longitudinal profile are shown in Figure 4.1-24

The watershed above the monitoring station encompasses about 0.79 square miles. The 1.5-year discharge is estimated to be 24.2 cfs. The elevation of the monitoring station is about 320 feet above sea level. Eighty-five percent of the watershed is below 890 feet in elevation. Bald Mountain (1,296') is the highest point in the watershed (Figure 4.1-1). About 59 percent of the watershed area has slopes from in the 0-10 percent range, and only 5 percent has slopes in excess of 20 percent (Figure 4.1-15).

The monitoring station is about 1,400 feet upstream of the confluence of Y Creek and Laguna Creek. The elevation of Laguna Creek at the confluence with Y Creek is about 195 feet. The elevation of the Y Creek monitoring station is about 320 feet. Therefore, the average channel gradient between the confluence and the monitoring station is over 8 percent.

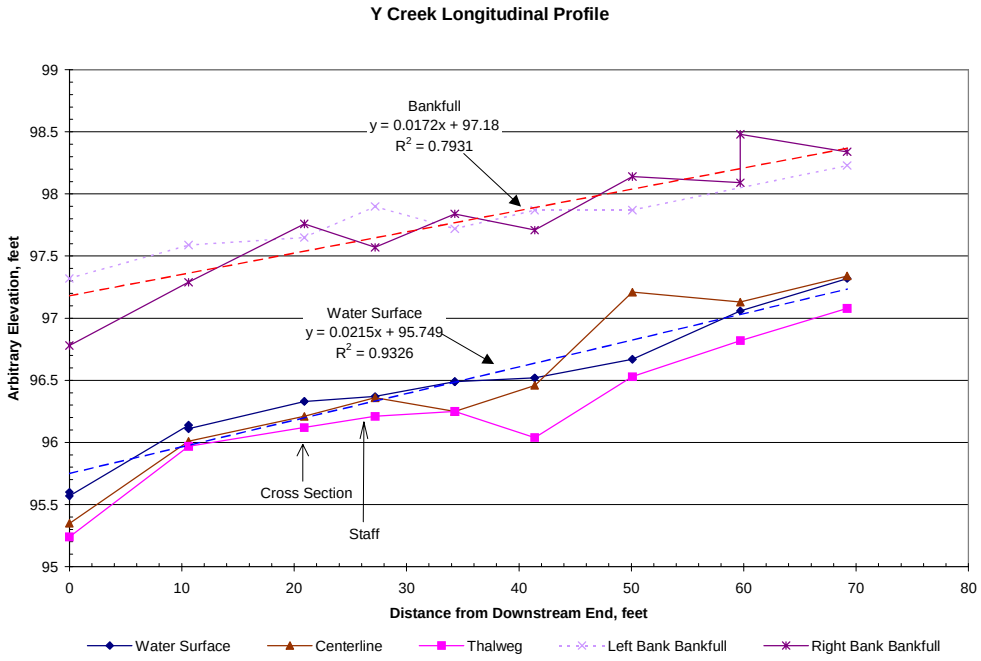
Bern Smith, the Coast Dairies Property manager, mentioned that the headwaters of Y Creek were logged in the past. A spur road, shown as Upper Y Creek Road in Figure 4.2-3 in the next section of this report, starts at the saddle between Y Creek and Yellow Bank Creek and ends in the upper Y Creek watershed. The road crosses Y Creek about 2,200 feet upstream of the monitoring station. The road crossing has washed out and the culvert is now lying in the streambed a distance downstream of the crossing. Near the crossing, the nearly vertical streambanks are five to six feet high. The culvert presumably failed during the February 1998 storms. Two more washed-out stream crossings on this road are located further up stream.

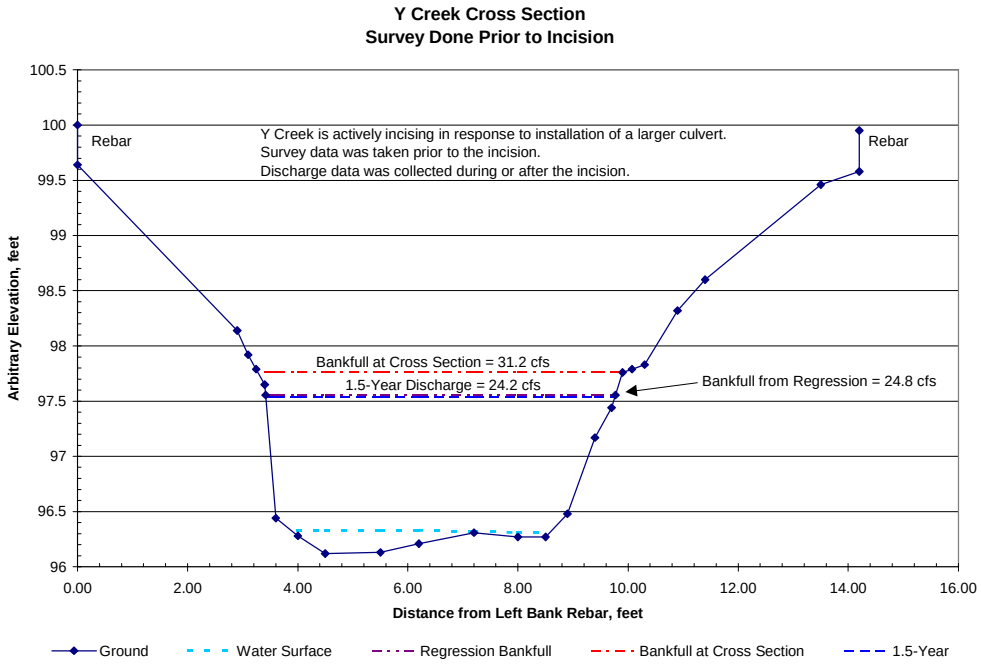
A ribbon of the highly erodible Santa Margarita Sandstone runs parallel to the creek along the flank of the ridge on the west side of Y Creek. The ribbon of Santa Margarita Sandstone starts about 1,400 feet upstream from the monitoring station and runs up to Bald Mountain.

There are several large slides on the ridge to the east of Y Creek that extend down to the creek. The Liddell Pipeline Road crosses the bottom of another slide on the ridge to the west of the creek.

Channel Incision

The Planning Team took the first measurement of stream discharge on Y Creek on January 12, 2001. Inspection of the channel revealed that the stream bed had eroded in the past month since the site was surveyed. The staff gauge was no longer in a pool but was on a riffle face. The lower end of the cross section had lowered about one foot. Subsequent visits showed that the incision appeared to stop after the bed at the staff gauge dropped about three-quarters of a foot, but the winter of 2000-2001 produced only small flood events, and it is reasonable to expect that large flood events could trigger further incision. The incision complicated the analysis since the slope of the channel is now much steeper than it was when the survey was done.





Note: The upper graph shows the longitudinal profile for Y Creek. The lower graph shows Y Creek in cross section.

Figure 4.1-24
Longitudinal Profile and Cross Section for
Y Creek Monitoring Station

The Monterey Formation underlies about 68 percent of the watershed above the monitoring station, and Santa Cruz Mudstone lies under about 15 percent of the watershed (see Figure 4.2-2 in the next section of this report), so mudstone underlies about 83 percent of the watershed. The majority of the rocks on the streambed at the monitoring station appeared to be mudstone. Rocks derived from mudstone have low density and are more easily transported by streams than denser rocks such as granite.

The channel incision at Y Creek following the replacement of the inadequate culvert demonstrates the sensitivity of a channel whose bedload consists primarily of mudstone. The nature of a stream's bed load needs to be considered when undertaking any projects involving alteration of a streambed.

Stage Discharge Relationship

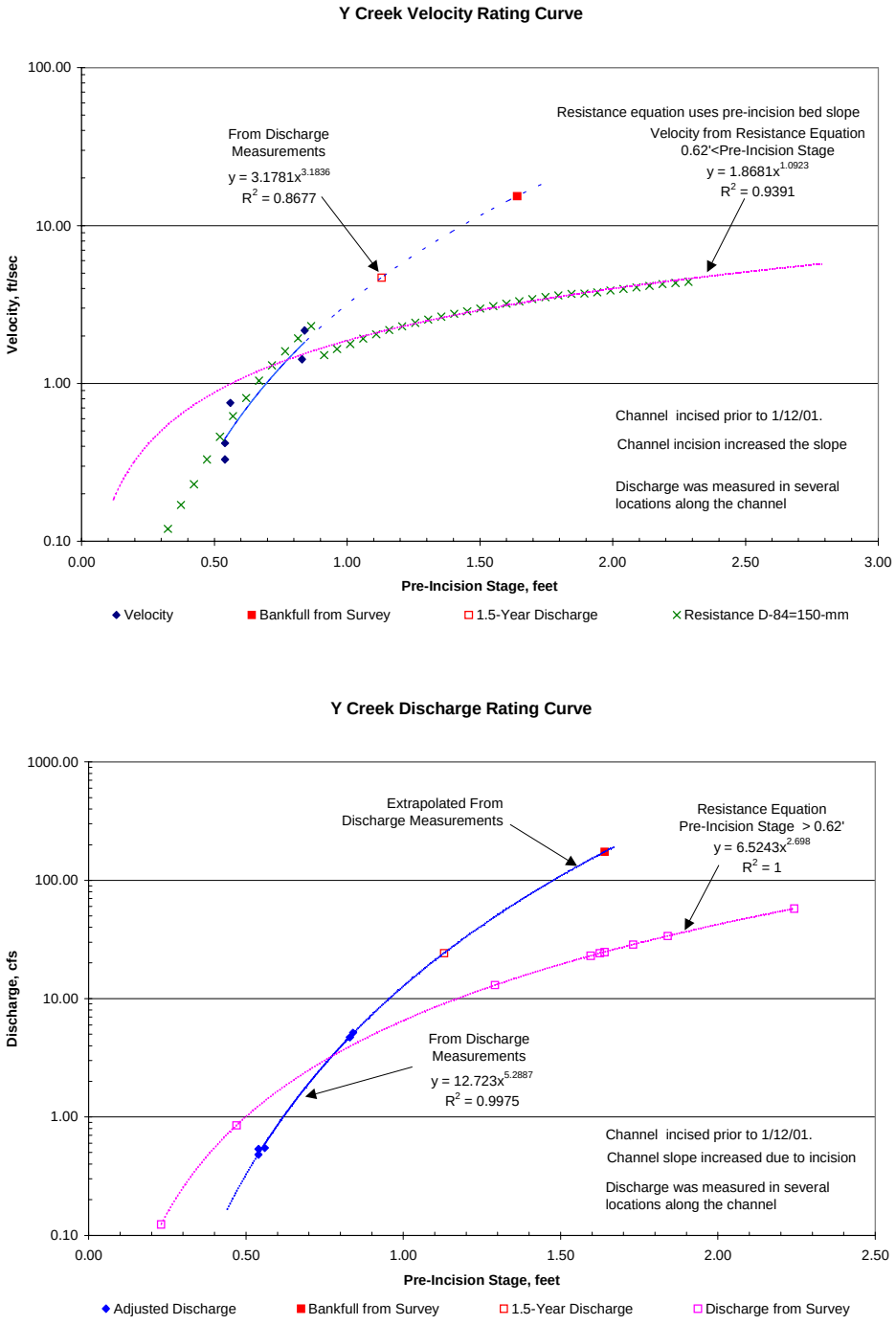
Five discharge measurements were made at the Y Creek monitoring station. The channel incision process began before the first measurement was made. The incision appeared to have stabilized prior to the second discharge measurement, but the first discharge measurement was made under different conditions than the other four measurements. In addition, the channel survey reflects a condition that is different from all of the discharge measurements.

The stage readings were made by measuring down from the top of the staff. The distance to the streambed from the top of the staff was also measured. Therefore, it was possible to apply a correction to convert the observed stage readings to the equivalent pre-incision stage readings. Adjusting the stage, however, cannot correct for the increased slope through the reach. Predictably, the discharge versus adjusted stage relationship, based only on the discharge measurements, gave an unrealistic estimate of bankfull discharge (174 cfs).

The survey data were input into the WinXSPRO computer program to analyze the cross section geometry. The WinXSPRO program can apply the Thorne and Zevenbergen flow resistance equation, if the size of the bed material in known. The size of the bed material was estimated from photographs (D_{84} = 150 mm). The survey data indicated that a change in the relationship between the cross section geometry and stage changed at 0.62 and again at 1.79 feet. Figure 4.1-25 compares the relationship of velocity-stage relationship developed from the discharge measurements to the relationship based on the resistance equation. Figure 4.1-25 also compares the relationship of discharge-stage relationship developed from the discharge measurements to the relationship based on the resistance equation.

Bankfull Discharge

The 1.5-year discharge for Y Creek is estimated to be 24.2 cfs. The bankfull level at the cross section predicted from a regression on all bankfull indicators in the surveyed section estimated the bankfull discharge to be 24.8 cfs.



Note: The upper graph shows the compares the velocity rating based on the discharge measurements and the velocity rating developed from the flow resistance equation and the survey for Y Creek. The lower graph compares the discharge rating based only the discharge rating constrained by the survey data.

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Figure 4.1-25
Comparison of Velocity and Discharge Ratings for Y Creek

Turbidity and Suspended Sediment

Ten turbidity measurements were made at the Y Creek monitoring station. Four of the turbidity measurements were made when the discharge measurements used to define the rating curve were made. The discharge for the other six turbidity measurements was estimated from the staff gauge reading. The turbidity measurements were made during discharges ranging from 1 percent of the 1.5-year discharge to 20 percent of the 1.5-year discharge. A regression of turbidity against discharge yielded the following relationship.

$$\text{Turbidity} = 35.464(\text{Discharge})^{0.8642} \qquad R^2 = 0.5694$$

Six suspended sediment measurements were made but four of them were found to be below the no-detect limit. Since only two suspended sediment samples had values greater than the no-detect limit, the relationship between suspended sediment and discharge and between suspended sediment and turbidity should not be used. The relationships are shown here only for completeness.

$$\text{Suspended Sediment} = 6.7615(\text{Discharge})^{-0.8943} \qquad R^2 = 1 \quad N = 2$$

The R^2 value of 1 is an artifact of having only two measurements and can not be interpreted as showing a strong relationship between suspended sediment and discharge.

Two measurements of suspended sediment and turbidity were available. A regression of suspended sediment versus turbidity gave the following equation.

$$\text{Suspended Sediment} = 0.0023(\text{Turbidity})^{2.2103} \qquad R^2 = 1 \quad N = 2$$

Again, the R^2 value of 1 is due to the small sample size, and cannot be interpreted as showing a strong relationship between suspended sediment and discharge

4.1.4 COMPARITIVE ANALYSIS OF COAST DAIRIES STREAMS AND THEIR WATERSHEDS

This section presents the Planning Team's analysis of existing conditions in the six Coast Dairies streams and their watersheds. The analysis is based on data gathered at the nine monitoring stations, and on physical attributes of the watersheds garnered from the Geographic Information System (GIS) under development for the Long-Term Resource Protection and Use Plan. The analysis focuses on the physical aspects of the watersheds that affect the natural suitability of each of the Coast Dairies streams for salmonids; and on observed and calculated indicators of watershed disturbance that affect water quality, channel morphology, and salmonid habitat.

4.1.4.1 FISH FLOWS

The Planning Team's stream surveys report the presence of "steelhead-like" salmonids on all of the Property's streams, both above and below migration barriers. It is assumed that the fish above

Turbidity and Suspended Sediment

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4.1.4.1 FISH FLOWS

The Planning Team's stream surveys report the presence of "steelhead-like" salmonids on all of the Property's streams, both above and below migration barriers. It is assumed that the fish above

the barriers are land-locked steelhead that would resume their anadromous behavior if the barriers were removed. As part of the hydrologic assessment, the Planning Team used discharge data to estimate if flow was adequate for migration.

National Marine Fisheries Service (NMFS) has recently adopted a policy recommending that the minimum bypass flow for water rights should be set equal to the median unimpaired February discharge. Table 4.1-8 shows the conditions at each monitoring station for the estimated median February discharge. This information can be used in the Long-Term Resource Protection and Use Plan as a basis for decisions regarding water use.

4.1.4.2 CONDITIONS AT BANKFULL DISCHARGE

Leopold et al. (1964) suggest that the median sized bed material on a riffle just begins to move when the discharge provides 75 percent of the bankfull depth. Leopold found that this discharge has a recurrence interval of about one-year. Table 4.1-9 gives the estimates for the discharge that has 75 percent of the bankfull depth. Bed material derived from sedimentary rock, which is found throughout the Coast Dairies watersheds to varying extents, is not as dense as solid rock. Therefore, the discharge that just mobilizes the median size bed material in some of the Property's streams may be less than that suggested by Leopold's rule-of-thumb.

The hydraulic conditions for bankfull discharge at each monitoring station are given in Table 4.1-10. The hydraulic conditions for the 1.5-year-discharge at each monitoring station are given in Table 4.1-11.

4.1.4.3 THE IMPORTANCE OF GEOLOGY TO SALMONIDS

The rocks, sand, and silt found on the bed of a stream (bed material) are derived from the various alluvial and bedrock units within its watershed. The nature and occurrence of the various geologic units in a watershed determines the quality of the bed material. The relative abundance, distribution, orientation and susceptibility to weathering of individual geologic units determine the relative amount of bed material derived from each geologic unit.

The nature of a stream's bed material is one of the factors that determine the suitability of the stream as salmonid habitat. Three aspects of the rocks on a streambed affect spawning success for salmonids: density, durability, and texture.

The density of the bed material plays a role in the success of salmonid spawning because density determines if a rock will be transported by a given discharge. Solid rock is generally assumed to have a density of 2.65 times that of water. Santa Cruz Mudstone has a porosity of about 35 percent (PG&E Power Plant Siting Study). Therefore, the density of rocks derived from Santa Cruz Mudstone should have about 65 percent of the density of solid rock. The lower density of mudstone rocks implies that a given size mudstone rock will be transported by the creek at a lower discharge than a similar sized rock of granite. The Shield's equation (CITATION) for shear stress

TABLE 4.1-8
HYDRAULIC CONDITIONS FOR THE FEBRUARY MEDIAN DISCHARGE

Monitoring Station	Watershed Area sq miles	Estimated February Median Discharge cfs	Estimated Average Depth of the February Median Discharge feet	Estimated Velocity of the February Median Discharge feet\sec	Estimated Width of the February Median Discharge feet	Width to Depth Ratio of February Median Discharge	Estimated Cross Section Area of the February Median Discharge sq feet	Percent of Estimated 1.5-Year Discharge	Estimated Exceedence Probability
Molino	1.50	2.09	0.51	0.60	6.89	13.52	3.51	6.0%	33.25%
Ferrari	1.28	1.75	0.42	0.69	6.08	14.61	2.53	6.0%	33.84%
San Vicente #1 (Lower)	10.49	19.40	0.86	1.24	18.24	21.23	15.68	6.3%	26.27%
San Vicente #2 (Upper)	9.89	18.13	0.93	1.34	14.47	15.52	13.48	6.3%	26.47%
Liddell #1 (West)	1.29	1.76	0.57	0.73	4.26	7.52	2.42	6.0%	33.82%
Liddell #2 (Main)	1.90	2.75	0.37	0.75	9.87	26.58	3.66	6.0%	32.36%
Laguna	7.60	13.42	0.88	1.21	12.57	14.25	11.09	6.2%	27.37%
Y Creek	0.79	1.01	0.38	0.69	3.88	10.31	1.46	5.9%	35.69%
Yellowbank	0.60	0.74	0.36	0.41	4.95	13.72	1.79	5.8%	36.75%

Note: Hydraulic conditions at each monitoring station for the estimated February median discharge. The National Marine Fisheries Service is recommending the February median discharge as the minimum bypass flow on salmonid streams.

TABLE 4.1-9
HYDRAULIC CONDITIONS FOR DISCHARGE WITH 75% OF BANKFULL DEPTH

Creek	Watershed Area sq miles	Stage feet	75% of Bankfull Average Depth feet	Hydraulic Radius feet	Width feet	Width to Depth Ratio	Cross Section Area sq ft	Velocity ft/sec	Discharge cfs	Exceedence Probability
Molino	1.50	1.66	0.87	0.75	8.6	9.8	7.5	2.07	15.5	4.57%
Ferrari	1.28	1.60	1.09	1.01	9.6	8.8	10.5	1.74	18.2	3.67%
San Vicente #1 (Lower)	10.49	2.56	1.56	1.51	22.1	14.1	34.6	3.17	110	2.56%
San Vicente #2 (Upper)	9.89	2.14	1.19	1.12	18.8	15.8	22.3	3.27	72.9	4.64%
Liddell #1 (West)	1.29	1.41	0.90	0.78	6.2	7.0	5.6	2.11	11.8	3.18%
Liddell #2 (Main)	1.90	1.88	0.79	0.75	12.2	15.5	9.6	2.27	21.9	2.14%
Laguna	7.60	2.14	2.20	1.94	14.1	6.4	31.0	3.88	120	1.40%
Y Creek	0.79	1.34	0.92	0.76	6.1	6.6	5.6	2.57	14.3	0.89%
Yellowbank	0.60	1.37	0.51	0.49	7.4	14.4	3.7	1.33	5.0	7.10%

Note: Hydraulic conditions at each monitoring station for discharge with 75% of the bankfull depth. This discharge is an estimate for the flow that initiates movement of the median size bed material on a riffle.

TABLE 4.1-10
HYDRAULIC CONDITIONS FOR BANKFULL DISCHARGE

Creek	Watershed Area sq miles	Stage feet	Average Depth feet	Width feet	Width to Depth Ratio	Cross Section Area sq ft	Velocity ft/sec	Bankfull Discharge cfs	Exceedence Probability
Molino	1.50	1.99	1.17	9.6	8.3	11.2	4.01	45.0	0.30%
Ferrari	1.28	1.91	1.45	11.0	7.6	16.1	2.28	36.7	0.33%
San Vicente #1 (Lower)	10.49	3.13	2.09	24.3	11.6	50.7	4.97	252	0.50%
San Vicente #2 (Upper)	9.89	2.77	1.58	22.2	14.0	35.2	6.34	223	0.58%
Liddell #1 (West)	1.29	1.82	1.20	7.9	6.6	9.5	4.08	38.8	0.30%
Liddell #2 (Main)	1.90	2.12	1.05	12.9	12.3	13.6	3.44	46.9	0.46%
Laguna	7.60	2.59	2.94	14.6	5.0	42.8	5.59	239	0.27%
Y Creek	0.79	1.64	1.22	6.3	5.2	7.7	3.21	24.8	0.27%
Yellowbank	0.60	1.73	0.68	8.8	13.0	5.9	3.21	19.1	0.26%

Note: Hydraulic conditions at each monitoring station for the estimated bankfull discharge.

TABLE 4.1-11
HYDRAULIC CONDITIONS FOR THE 1.5 – YEAR DISCHARGE

Monitoring Station	Watershed Area sq miles	Elevation of top of Staff	Datum feet	Stage feet	Average Depth feet	Width feet	Width to Depth Ratio	Cross Section Area sq ft	Velocity ft/sec	Estimated 1.5-Year Discharge cfs	Exceedence Probability
Molino	1.50	97.86	95.5	1.97	1.15	9.6	8.3	10.9	3.84	42.1	0.35%
Ferrari	1.28	97.27	94.5	1.91	1.45	11.0	7.6	16.1	2.29	36.7	0.33%
San Vicente #1 (Lower)	10.49	96.02	93	3.06	2.02	24.0	11.9	48.5	4.73	230	0.49%
San Vicente #2 (Upper)	9.89	96.61	94	2.75	1.57	22.1	14.1	34.8	6.26	218	0.49%
Liddell #1 (West)	1.29	97.89	95	1.80	1.18	7.9	6.6	9.3	3.98	37.0	0.33%
Liddell #2 (Main)	1.90	98.99	95	2.15	1.09	13.0	11.9	14.2	3.63	51.8	0.37%
Laguna	7.60	98.72	96	2.37	2.57	14.3	5.6	36.8	4.71	173	0.46%
Y Creek	0.79	99.06	94.5	1.62	1.21	6.3	5.2	7.6	3.17	24.2	0.28%
Yellowbank	0.60	98.93	95.5	1.72	0.68	8.8	13.0	5.9	3.21	19.1	0.26%

Note: Hydraulic conditions at each monitoring station for the estimated 1.5-year discharge.

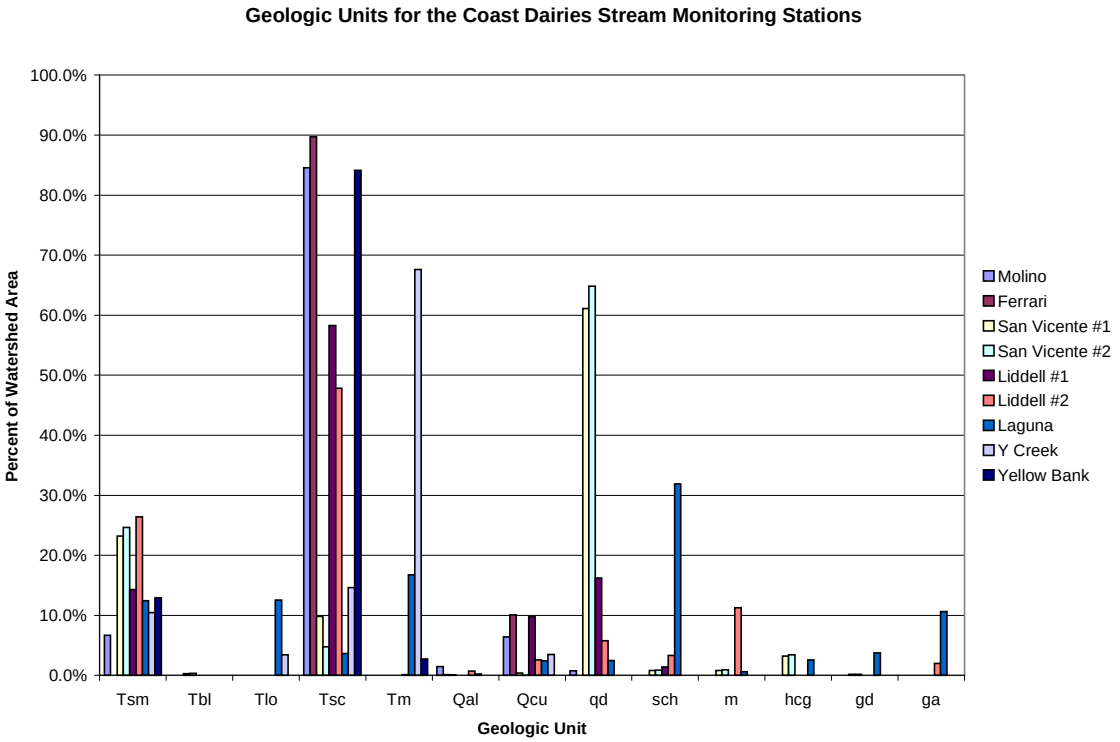
reveals that, for the same set of hydraulic conditions, a stream can move mudstone rocks that have a diameter of about 2.3 times the diameter of granite rocks. Therefore, smaller discharges are required to initiate bedload transport of mudstone compared to granite rocks of the same size. Hence, salmonid eggs laid on a stream bed composed mostly of mudstone derived rock are more likely to be scoured during periods of high discharge than eggs laid in a bed derived from granitic material under the same flow regime.

Durability of the rocks on the streambed also plays a role in determining the stream's suitability for salmonid spawning. The Santa Cruz Mudstone is not very durable and tends to shatter easily. Therefore, mudstone rocks are likely to be broken and wear down more readily while they are being carried along the bed of streams during flood events. Since the mudstone rocks tend to break easily, they will tend to retain their angular appearance and would likely disintegrate and breakdown to fine-grained materials before they achieve a well-rounded shape. Igneous rocks are much more durable, tending to resist breakage during the sediment transport process and develop a smooth, rounded appearance over time.

The Department of Fish and Game considers angular material to be of poor quality for spawning because the pieces fit together, making it more difficult for adult salmonids to move the material. In addition, the overlap of individual angular pieces has the potential to reduce the flow of water to eggs deposited in a redd. Finally, young fish have more difficulty leaving a redd constructed in angular material because there are fewer interstices for the young fish to wiggle through, compared to a redd in rounded material (Jones, 2001)

Texture refers to the size of the individual grains in a rock. The sedimentary Santa Cruz Mudstone is composed of relatively fine-grained material (silt and clay), compared to igneous or metamorphic rock that could include crystallized minerals of various sizes and hardness. The durability of the rock and its resistance to weathering determines the rate at which the "parent" rock can break down into its individual grains. Upon weathering, weakly consolidated, less dense, fine-textured rock will provide more fine material (clay, silt, and small sand) to a streambed than a hard, durable, fine-textured rock. The sedimentary rocks in the Coast Dairies watersheds are composed of mostly fine-grained material and are not very durable. The weathering and erosion processes that transport the sedimentary rocks to the stream will tend to break the rock and result in a mixture of fine and coarse particles being deposited into the stream channel. The sediment transport process will further transform the sedimentary rocks into fine materials. A streambed with a high percentage of silt and clay (fine material) is less suitable for salmonid spawning and rearing than one composed mainly of coarse material.

The bar graph in Figure 4.1-26 shows the percentage of watershed area covered by each geologic unit for the watersheds of the nine monitoring stations. The table in Figure 4.1-26 describes each geologic unit shown in the bar graph. The sedimentary rocks in the Davenport area have low density, are fine-textured, and have low durability. In general, conditions for salmonids are sub-optimal in streams dominated by sedimentary rock. The igneous and metamorphic rocks have normal density, are fine to coarse grained, are durable, and in general provide better conditions



Geologic Unit	Class	Mount's Erosion Susceptability Weighting	Description
Tsm	Sedimentary	10	Santa Margarita Sandstone (upper Miocene)
Tbl	Sedimentary	7	Lower Butano Sandstone Member (Eocene)
Tlo	Sedimentary	7	Lompico Sandstone (middle Miocene)
Tsc	Sedimentary	6	Santa Cruz Mudstone (upper Miocene)
Tm	Sedimentary	5	Monterey Formation (middle Miocene) shale
Qal	Mixed	5	Alluvial Deposits (Holocene)
Qcu	Mixed	5	Coastal terrace deposits (Pleistocene)
sch	Metamorhpic	4	Metasedimentary rocks - schist & quartzite (Mesozoic or Paleozoic)
m	Metamorhpic	4	Marble (Mesozoic or Paleozoic)
qd	Igneous	4	Quartz diorite (Cretaceous)
hcg	Igneous	3	Hornblende-cummingtonite gabbro (Cretaceous)
gd	Igneous	3	Gneissic granodiorite (Cretaceous)
ga	Igneous	3	Granite and adamellite (Cretaceous)

Note: The bar graph shows the percentage of watershed area covered by each geologic unit for the watersheds of the nine monitoring stations. The table shows the description of the mapping symbol of each geologic unit shown in the bar graph. The sedimentary rocks, in the Davenport area, have low density, are fine-textured and have low durability. In general, conditions for salmonids are sub-optimal in streams dominated by sedimentary rock. The igneous and metamorphic rocks have normal density, are fine to coarse grained and are durable. In general, conditions for salmonids are more likely to be optimal in streams dominated by sedimentary rock.

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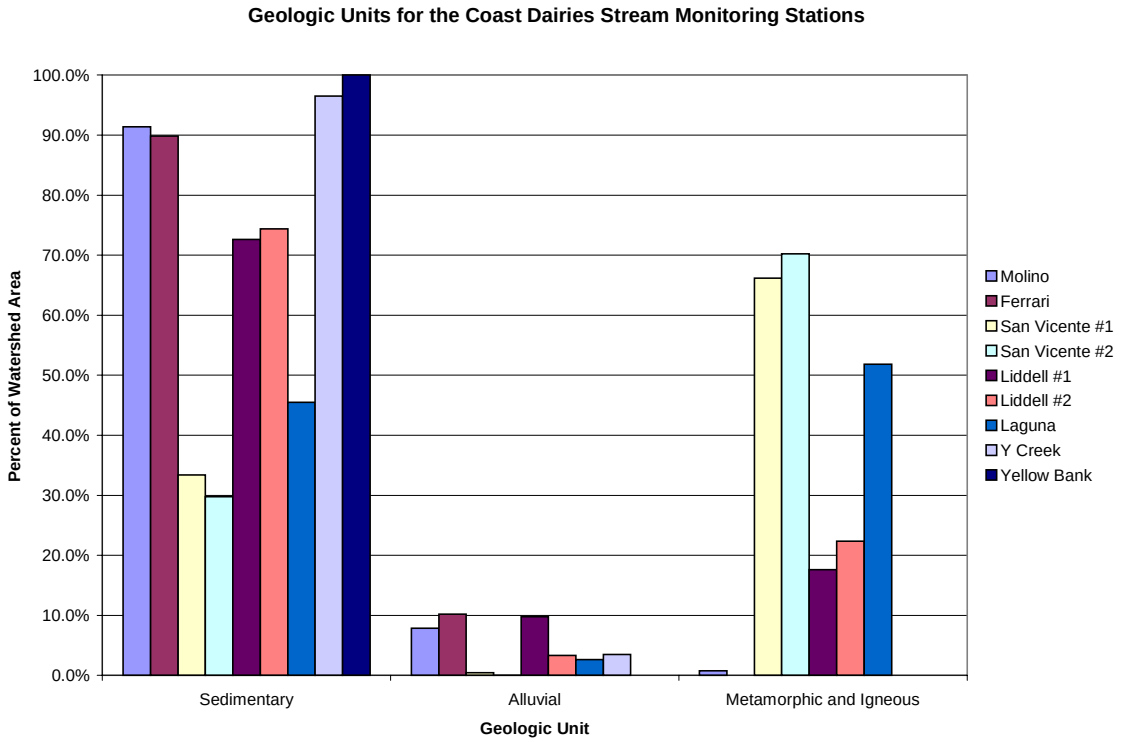
Figure 4.1-26
Geologic Units for the Coast Dairies Watersheds



Note: The percentage of each monitoring watershed covered by sedimentary, alluvial or igneous and metamorphic rock is shown in the bar graph. Streams whose watershed geology is dominated by igneous metamorphic rocks are more likely to provide optimal salmonid habitat than streams whose watershed geology is dominated by sedimentary rock. Alluvial deposits can be composed of material derived from sedimentary, igneous or metamorphic rocks.

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Figure 4.1-27
Sedimentary, Alluvial, Metamorphic, and Igneous Rock in the Coast Dairies Watersheds

for salmonids. Figure 4.1-27 shows the percentage of the watershed above each monitoring station dominated by sedimentary rock.

Salmonid Suitability

San Vicente Creek watershed has the lowest percentage of sedimentary rocks and the highest percentage of igneous or metamorphic rocks. Therefore, based only on the geology, San Vicente Creek is expected to provide the most suitable bed materials for salmonids.

Slightly more than 50 percent of the Laguna Creek watershed is covered by igneous and metamorphic rock and just less than 50 percent of the watershed is covered by sedimentary rock. Therefore, based only on the geology, Laguna Creek is expected to provide bed material that is moderately suitable for salmonids. The Laguna Creek bed material should be less optimal than the San Vicente bed material but should be superior to the bed material found in Liddell Creek.

The geology of the Liddell Creek watershed is mostly sedimentary (>70 percent), but about 20 percent of the watershed is metamorphic or igneous. Therefore, based only on the geology, Liddell Creek is expected to provide bed material that is less suitable for salmonids than San Vicente or Laguna Creeks. However, the geology of Liddell Creek is expected to produce bed material that is more suitable for salmonids than a creek with little igneous or metamorphic rock such as Molino Creek (0.75 percent) or no igneous or metamorphic rock such as Ferrari Creek and Yellow Bank Creek.

4.1.4.4 WATERSHED SENSITIVITY

Part of the preparation of the Long-Term Resource Protection and Use Plan will include an evaluation of land-uses suitable for given portions of each of the Property's watersheds. Assessing the sensitivity of a watershed to various types of land management activities is a fundamental step in the planning process.

For the purposes of this report, *watershed sensitivity* is defined as:

> *… the sensitivity of a watershed to the disruption of its ecological or hydrological processes.*

One of the key indicators of disruption of the aquatic ecosystem and its supporting hydrologic processes is a change in the fundamental rate at which sediment is delivered to the stream network. Estimating the potential erosion hazard for each unit of the landscape is a first step in understanding how a watershed's rate of sedimentation will respond to disturbance. Such a measure is useful for regional planning decisions but is not a substitute for site specific fieldwork to address the needs of individual projects. This is because soils and geologic unit map boundaries are not precise, since they smooth differences in order to present a regional view.

The soil survey for Santa Cruz County includes an erosion hazard rating for each soil type. However, this erosion hazard rating was developed for agricultural land and is not suitable for the rugged topography of the Santa Cruz Mountains. As shown in Figure 4.1-28, most of the watershed area upstream of the nine stream monitoring stations has either a "high" or a "very high" erosion hazard rating, as assigned by the soil survey. An alternate method of estimating the erosion hazard rating, which is more sensitive to the actual conditions on the Coast Dairies Property, is desirable.

Santa Cruz County recognized the shortcomings of the soil survey erosion hazard rating during the preparation of the *San Lorenzo River Watershed Management Plan* (Santa Cruz County, 1979). In response, Mount (1977) developed an Erosion Hazard Potential for the San Lorenzo watershed. His method appears to be suitable for Coast Dairies, since portions of the San Lorenzo River watershed have soils and geology similar to those on the Property.

Mount's method combines information from geologic maps, soil maps, topographic maps and land-use maps. The method is essentially an equation of five factors and their weightings. Mount conducted extensive fieldwork to develop a system to estimate the value for each type of geologic

unit, soil unit and so forth, which are presented in a series of tables. Different weighting factors were then tried until the resulting erosion hazard potential gave results similar to field measurements. The final equation for Mount's erosion hazard potential is:

EHP = (1) x (Soil) + (4) x (Geology) + (2) x (Slope) + (30) x (Landslide) + (1) x (Land use)

The landuse factor includes vegetation. Mount expressly states that the magnitude of the different weightings does not imply the order of importance of the factor. Applying the EHP equation to each unique combination of soil, geology, slope etc. will result in a numerical rating for the erosion hazard of that area. Depending on the EHP value, watersheds can be placed into one of four classes of erosion hazard potential: low, moderate, high, or very high.

Presently, GIS layers for geology, soils, and topography are available for the Coast Dairies Property. However, the Planning Team could not locate a suitable digital landslide layer. Therefore, Mount's erosion hazard potential could not be implemented by the GIS system at this time.

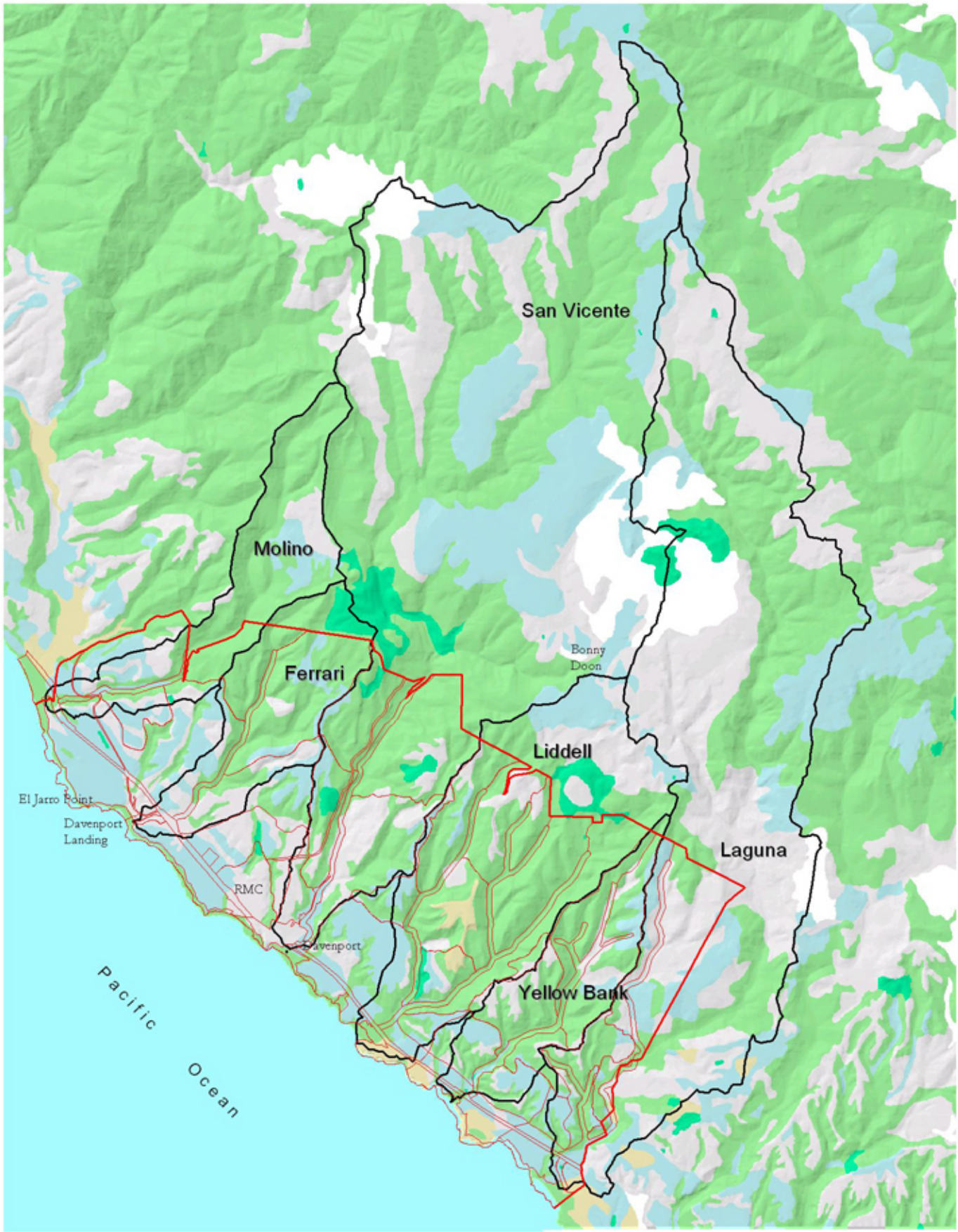
To help guide the discussion of the erosion hazard potential for the nine study watersheds, the Planning Team devised another rating scheme based on the information available for the Property. The method uses information about the soils, slopes, and geology of each watershed to assign an erosion hazard potential of low, moderate or high. The method does not use information about landslides, vegetation, or landuse, since the information was not available in GIS layers in time for preparation of this section of this report. The erosion hazard potential presented here is subject to revision, and should be revised when additional data become available. The derivation of the erosion hazard potential is described in the following sections.

Soils

The soil survey maps for Santa Cruz County were used to map the distribution of hydrologic soil groups in the watershed above each monitoring station (Figure 4.1-29). Hydrologic soil groups are used to estimate runoff from precipitation. Soils are placed into one of four groups on the basis of their ability to absorb additional water after they have been thoroughly wetted to simulate infiltration from long-duration storms. The soil groups are labeled A through D in descending order of infiltration rate:

- Group A soils have a high infiltration rate
- Group B soils have a moderate infiltration rate
- Group C soils have a slow infiltration rate
- Group D soils have a very slow infiltration rate

The hydrologic soil groups from the soil survey are based on the concept that precipitation in excess of infiltration rate results in overland flow (Hortonian flow) and thus generates runoff. Modern views of the rainfall-runoff process offer a more complex view in which overland flow is only one mechanism that provides storm runoff. The other pathways include subsurface flow and saturation-excess overland flow (Dunne and Leopold, 1978). The hydrologic soil group also does



SOURCE: Environmental Science Associates,Pacific Meridian Resources, USGS,USDA Soil Conservation Service

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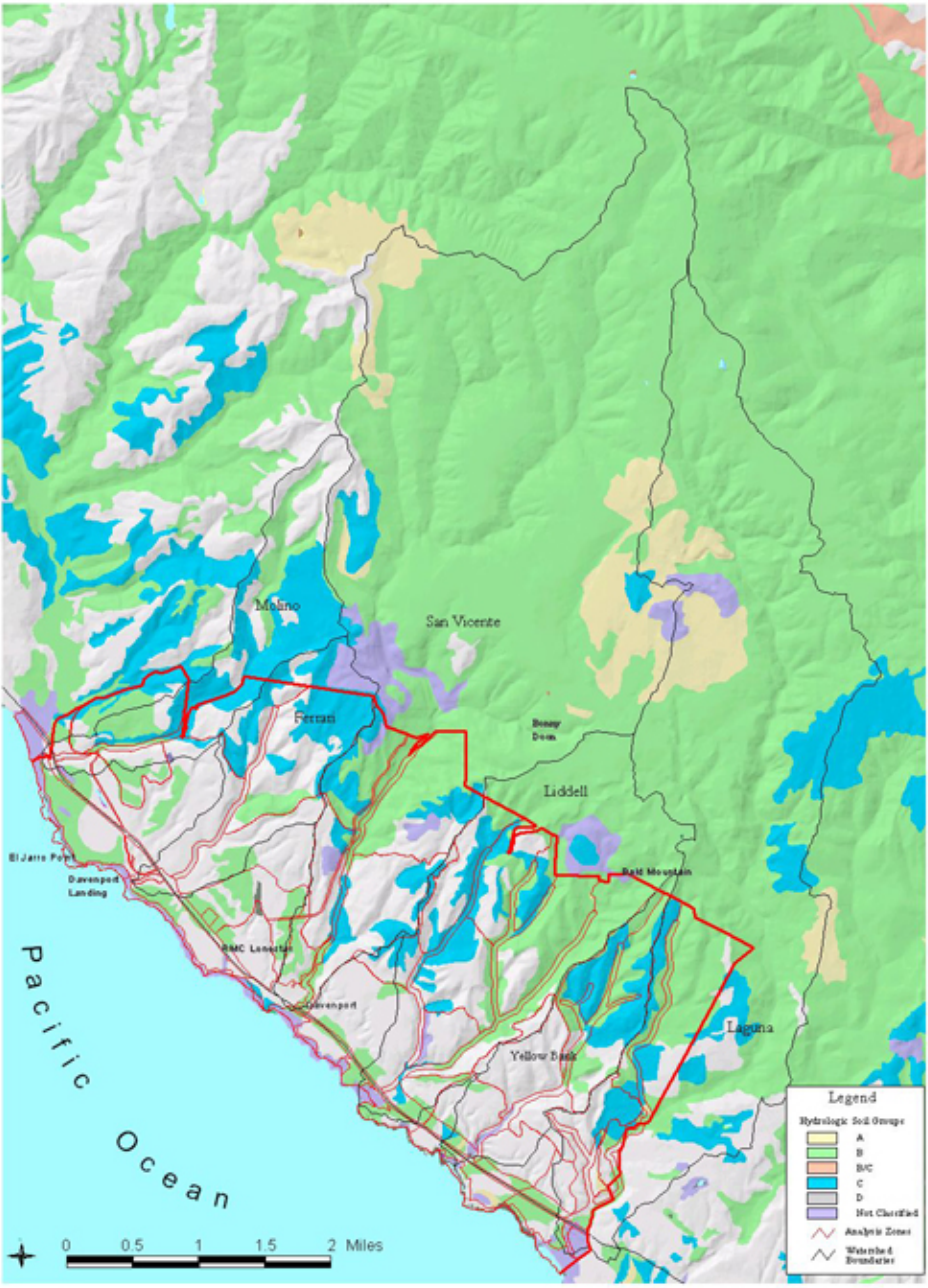
Figure 4.1-28

Erosion Hazard Ratings in the Coast Dairies Area



SOURCE: Environmental Science Associates, Pacific Meridian Resources, USDS

Figure 4.1-29

Hydrologic Soil Groups in the Coast Dairies Area