

A Development in Harmony with Nature?¹

James R. Vilkitis²

Abstract: Buena Vista Country Club (BVCC), Inc. proposes an 18-hole target golf course and support facilities in Santa Cruz County, California. Environmental concerns include federal and state listed endangered plant and animal species, and two habitats of concern to Santa Cruz County including the San Andreas Coastal Live Oak Woodland. An ecosystem management philosophy was developed to design the BVCC in an attempt to maintain the integrity of the site resources. Field research data was put into a geographical information system (GIS) and used to analyze project alternatives and develop a Conservation Plan (Plan). The Plan was developed to protect the endangered species through the implementation of a Habitat Conservation Plan (Salamander Reserve), to maintain the integrity of the biotic communities by establishing an Oak Preserve, and to implement the preferred golf course alternative. It integrates these components into a Plan. The question remains—would it work? The answer lies with the monitoring program and the ability of applied management to respond to the results of monitoring.

This paper presents an overview of the analysis of the Buena Vista Country Club, Inc. (BVCC) project in Watsonville, California, and the preparation of a Conservation Plan (Plan) that attempts to create a “Development in Harmony With Nature.” The Plan consists of three components: (1) a Habitat Conservation Plan, (2) an Oak Preserve, and (3) an 18-hole target golf course.

A Draft Habitat Conservation Plan (DHCP) was developed by the Coastal Resources Institute (CRI) at California Polytechnic State University, San Luis Obispo. The DHCP assessed the action alternatives for the golf course development and country club and identified goals and quantifiable objectives that would enable Alternative 3 to be implemented successfully on the site. The Oak Preserve serves to protect and conserve the remaining natural resources of the site. The goal of the preserve is to maintain the integrity of associated plant communities within the site and serve as the environmental buffer that will sustain the system. The 18-hole target golf course and country club is the project. A target golf course is unique in that it allows the golfer to play over obstacles such as water or vegetation which may allow for more of the natural resources to be preserved. The patchwork of obstacles would serve as the linkage to connect habitats of the Oak Preserve.

In general, the Plan process involved identifying and incorporating the concerns of the stakeholders (public and private) and the developer into two action alternatives that would attempt to avoid, minimize, and prevent significant adverse effects to the natural environment. Environmental monitoring and management elements were incorporated to ensure that the goals and objectives of the Plan were being met.

Major environmental issues included the preservation of the Santa Cruz long-toed salamander (a federal and state listed endangered species) and the California tiger salamander (a federal candidate species and a state Species of Special Concern), four plant species listed by the California Native Plant Society, two habitats that are of special concern to Santa Cruz County (San Andreas Coastal Live Oak Woodland and Maritime Chaparral), wetland sites, and grading.

¹An abbreviated version of this paper was presented at the Symposium on Oak Woodlands: Ecology, Management, and Urban Interface Issues, March 19-22, 1996, San Luis Obispo, Calif.

²Director, Coastal Resources Institute, California Polytechnic State University, San Luis Obispo, CA 93407.

Implementation Philosophy

The philosophy for developing the Plan was based on preserving and protecting the animal and plant species of concern by maintaining the integrity of the biological and physical attributes of the site upon which they depend while still providing recreational opportunities. An intense environmental audit of the vegetation, soils, drainages, and life histories of the sensitive species was conducted. These data were placed in a geographic information system (GIS) which was used to develop two action alternatives and to assess the effects of each alternative on the plants and animals of the site. Since all issues raised could not be ameliorated, a planning hierarchy for addressing them was developed. The strategy was to first address federal concerns, then those identified by the state and local governments. The issues were assessed using the GIS and interdisciplinary team discussions. Management strategies were developed for components of the Plan to guide project implementation and subsequent monitoring and management activities. The Plan was the result of those efforts.

Site Location and Land Use

The proposed project site encompasses approximately 285 acres in southwestern Santa Cruz County, Calif. It is located 2 miles west of the Watsonville airport and 1.5 miles east of Watsonville. It is bounded on the northeast by State Highway 1, on the south by Fiesta Way and Rancho Road, and on the west by cultivated lands east of Willow Springs Road.

The site encompasses three parcels of privately owned open space with one residential unit occupied by a caretaker who provides security. Most of the property surrounding and adjacent to the proposed golf course is designated either Agriculture or Mountain Residential. These areas are outside the Santa Cruz County Urban Service area; therefore, development is limited at this time.

Environmental Setting

The project location is characterized by warm summers and mild winters with average temperatures from 54 to 58 °F. Precipitation is light, and rainfall averages 20-25 inches per year. Average humidity is fairly high (70-80 percent) during the entire year owing to a strong marine influence. Clouds, fog, or overcast conditions occupy 30-40 percent of the daylight hours throughout the year.

The geology is relatively uniform. It is mapped as Pleistocene, non-marine Quaternary Aromas Formation. The ridgetops and shoulder slopes expose many outcroppings of a weakly cemented sandstone sheet that appears to underlie the entire site. The dune sheet has been eroded into a series of parallel north- to south-trending ridges and valleys. Elevations range from approximately 190 feet at the southern boundary to 470 feet near Highway 1. Four drainages exist on the site (*fig. 1*), two of which have the potential to carry seasonal runoff from Highway 1. The bases of the drainages are influenced by runoff and seasonal seepage from the ground water table. At the present time the surface water table is close to the valley floors and supports seasonal wetlands and intermittent ponds.

Five different soil series were mapped as nine separate soil map units on the basis of slope differences within the series. The site is covered primarily by Baywood loamy sand, 2-60 percent slopes. This soil type is very deep and well drained. Permeability is high, and available water capacity is very low. Surface runoff is rapid and erosion hazard moderate under native vegetation and very high if vegetation is removed and the soil left bare. Other soils present on the site

Legends

-  Monterey Spineflower ▲ California Bottle-brush Grass
 Hooker's Manzanita ● Kellogg's Horkelia

Vegetation Types

Code	Community
CLO	San Andreas Coast Live Oak Woodland
CLOd	a. dense trees
CLOm	b. moderate trees
CLOs	c. sparse trees
MP/CLO	Monterey Pine/Coast Live Oak Woodland
NP	Monterey Pine Forest
DF	Douglas Fir Forest
R	Riparian Woodland
W	Scattered Intermittent Wetland
CS	Coastal Scrub
U	Maritime Chaparral
FW	Freshwater Marsh
D	Disturbed

--- Watershed Boundaries

— Drainages

Contour intervals = 10 feet

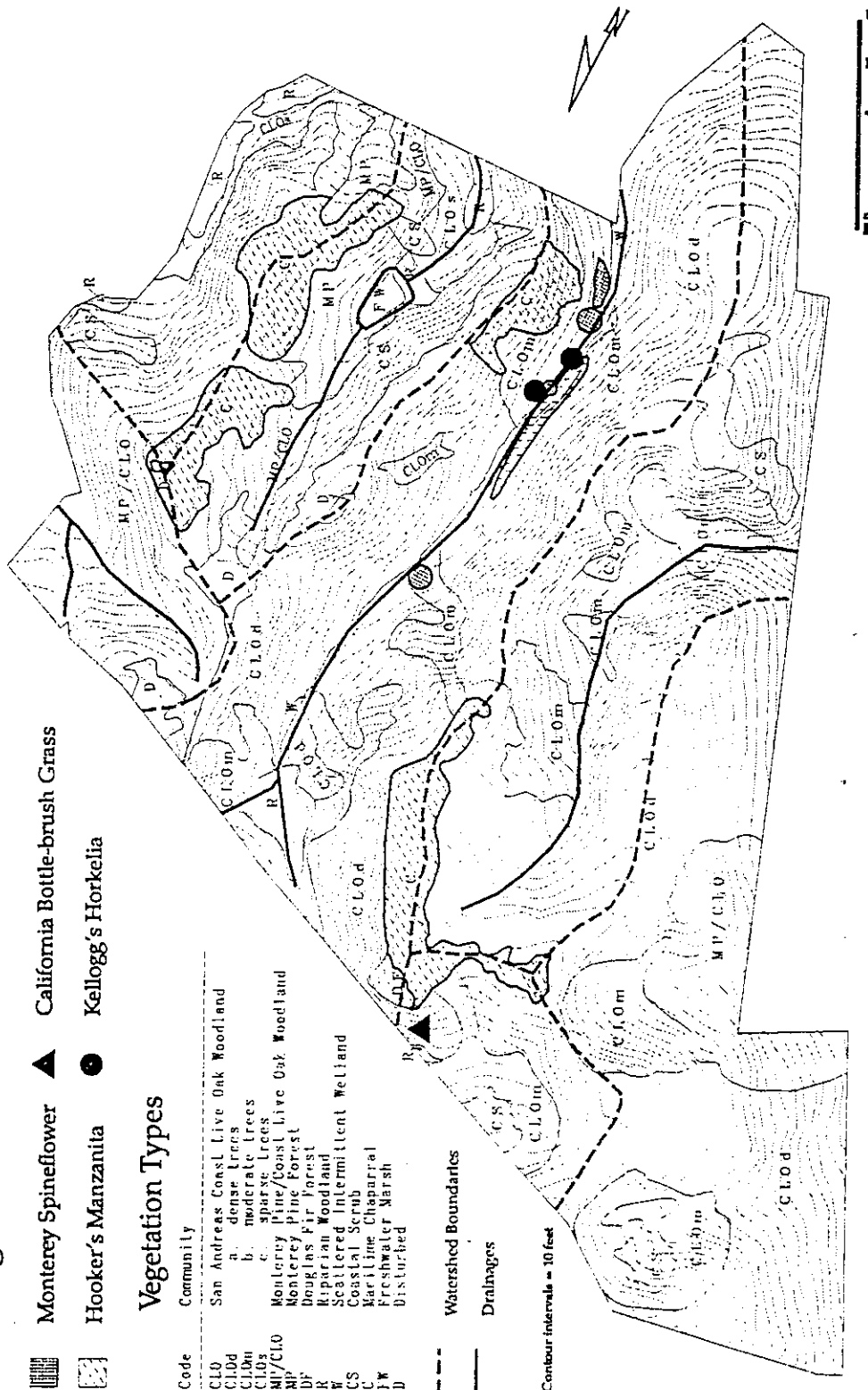


Figure 1—Watershed boundaries, vegetation, and sensitive plant species.

include Seaside sandy loam, 1-15 percent slopes; Yorkville sandy loam, 2-30 percent slopes; Deven variant loam, 5 to 30 percent slopes; and Columbia loamy sand, 1-2 percent slopes. Columbia loamy sand is classified as a hydric soil and was found in the central drainage of the site. Permeability of this soil type is moderately slow, and drainage problems are of primary concern.

The site is covered mostly by woodland or forest type vegetation. The dominant plant cover is San Andreas coastal live oak woodland, hereafter referred to as oak woodland (68 percent). However, Monterey pine/coastal live oak woodland (15 percent), Monterey pine woodland (2 percent), and Douglas-fir woodland (<1 percent) also occur. Combined, these communities cover more than 85 percent of the site (*fig. 1*). San Andreas maritime chaparral covers about 6 percent of the site and northern coastal scrub about 4 percent. Other communities combined cover less than 4 percent of the site (e.g., freshwater marsh, riparian woodland).

The eastern portion of the property, where the residence is located, shows much evidence of human disturbance, including roads, trails, and graded and cleared areas. This region also has the majority of introduced trees and shrubs, including some, such as Monterey pine, which have become naturalized and are actively spreading. On some roads and the areas adjacent to them, the topsoil is gone, and the sandstone parent material is visible. Rancho Reservoir (the freshwater marsh community) was created by a berm that was established across the easternmost drainage. The remainder of the site, approximately two-thirds of the total acreage, shows little sign of human impact except for firebreaks and the trails leading to them, all of which are now overgrown. This region is dominated by the dense phase of the oak woodland. Much of it is inaccessible. In the areas which were sampled, very few non-native plant species were found.

Wildlife species are those that are adapted to oak woodland and chaparral/coastal scrub habitats. They include 5 species of amphibians, 4 reptiles, 29 species of birds, and 12 species of mammals. Characteristic bird species found in the oak woodland and chaparral include the chestnut-backed chickadee, plain titmouse, bushtit, bewick's wren, wrentit, and rufous-sided towhee. The song sparrow can be found in the riparian areas. Species of mammals that are characteristic of the area include the brush rabbit and the black-tailed deer.

Project Descriptions / Components of the Conservation Plan

The 18-hole target golf course and country club were the impetus for the Plan. It will be a members' course open to the public. Membership is expected to reach 500 at full capacity, with an expected daily use of 144 to 240 rounds of golf. The course will include a practice range and 18 holes located along the ridges and valleys of the site. To add to the visual esthetic, wetland values, and habitat diversity, new ponds will be created to supplement Rancho reservoir, which will be enhanced and maintained.

A two-story clubhouse (16,000 square feet), a mid-course facility containing restrooms and a snack bar (180 square feet), a golf cart storage shed, a maintenance building, and a utility washdown shed are the only proposed structures. No homes are planned as part of the project. In full operation, the course will employ 36 persons full-time and 10 to 15 persons part-time. Two parking lots providing a total of 153 parking spaces are planned and will be located north and northwest of the clubhouse. A detention pond will be created for runoff from the highway and the parking area. Auto traffic will be limited to the main road and parking area.

“Target” golf courses, which incorporate more natural vegetation and habitats in their design, require less irrigation than a typical course. It is estimated that approximately 95 acres will be irrigated with reclaimed wastewater from the Watsonville wastewater treatment facility. Turfgrass irrigation requires 1 to 7 inches of water per month, depending on the season—approximately 400,000 gallons per day during July and August, with an annual average of 180,000 gallons.

A Salamander Reserve will be created to protect and preserve the Santa Cruz long-toed Salamander and the California tiger salamander. It will be a natural area dedicated to the salamanders and will exclude any activities that could negatively affect the salamanders. Management will be directed at enhancing the area to stabilize erosion, eliminating exotic plant species, and adding an additional breeding pond and dry-season refuge sites. The establishment of the Salamander Reserve that discontinues landscape abuse, enhances the breeding pond, and provides an additional breeding site should stabilize the population dynamics of the salamanders and increase their chances of survival. The Salamander Reserve under all action alternatives will be larger than the salamanders’ minimum known habitat. To ensure that the Salamander Reserve’s resources will be maintained primarily for the benefit of the salamanders, monitoring and management plans have been developed and incorporated into the DHCP and Implementation Agreement. Results of monitoring activities will be reviewed annually by the U.S. Fish and Wildlife Service (USFWS) and California Department of Fish and Game (DFG), and management strategies will be adjusted to meet goals and objectives.

An Oak Preserve will be established, as a demonstration forest, to protect and conserve the biological resources of the site, particularly the oak woodland and associated communities. The Oak Preserve will include all areas not considered in the golf course play area and associated structures, including the revegetated areas, wetland areas, freshwater marsh, oak woodland, and maritime chaparral. It will be managed to maintain the mix of plant communities that presently exist on-site and in the area. Exotic plant species and/or non-indigenous plants that are not considered essential to existing communities will be removed.

In an attempt to allow the living landscape to function as naturally as possible, the landscape surrounding the fairways and greens will be designed to prevent overland flow of surface water and ensure that the applied fertilizers and pesticides will not leave the effective root zone of the plants. The golf course will be monitored and managed to maintain the integrity of the natural systems of the site. To assure objectivity, an independent educational institution will coordinate and manage the monitoring programs in cooperation with USFWS and DFG and will provide feedback to the County and regulatory agencies as required.

Major Issues

Issues of concern to federal and state agencies include two species of salamander and four plant taxa listed by the California Native Plant Society (CNPS). Issues of concern to Santa Cruz County, as presented in the General Plan (1980), are the effects of the project on two sensitive plant habitats (communities) as well as the effects that grading will have on indigenous plants and animals.

Animals of Concern

The federal and state listed endangered Santa Cruz long-toed salamander (*Ambystoma macrodactylum croceum*) and the California tiger salamander

(*Ambystoma californiense*), a federal candidate species and a state Species of Special Concern, are the animals of concern. The Santa Cruz long-toed salamander (SCLTS) was listed as endangered in 1966 by the federal government and by the state in 1970. It is classified as a "mole" salamander because it spends most of its life underground, usually in mammal burrows. Five subspecies of the SCLTS are found in the Pacific Northwest. Ten SCLTS breeding populations exist currently in the Monterey Bay region. These populations are found in ponds between Aptos in Santa Cruz County and Castroville in Monterey County, California. The population found on the site, known as the Buena Vista population, is the most newly discovered breeding population.

The California tiger salamander (TS) is a federal Category 1 candidate species and is on the California Natural Diversity Database list of Species of Special Concern. The range of the TS extends from the Sacramento Valley south to Santa Barbara (Stebbins 1985). It is found in the San Joaquin Valley and surrounding foothills of both the Coast Ranges and the Sierra Nevada. This lowland species is restricted to the grasslands and lowest foothill regions of Central and Northern California in which breeding habitat (long-lasting vernal ponds) occurs (Shaffer and Stanley 1992).

The breeding habitat for the SCLTS and TS on site is Rancho Reservoir, a small, manmade, ephemeral pond on the southeastern portion of the site. It is capable of containing up to a half acre of seasonal drainage, but normally the pond area is no more than 20 by 40 feet, and during the summer months it is dry. The slopes surrounding the reservoir appear to have been used extensively for off-road trail vehicles. The natural vegetation has been destroyed in the vehicular pathways. This has accelerated erosion, causing sedimentation of the reservoir area.

Plant Species of Concern

Four plant species found on the site are listed in the California Native Plant Society's (CNPS) Inventory of Rare and Endangered Vascular Plants of California.

Hooker's manzanita (*Arctostaphylos hookeri* ssp. *hookeri*) is currently placed by CNPS on List 1B. It has a R-E-D code of 2-2-3. It is not presently listed by the state or federal government as endangered or threatened, but it has been placed on the California Department of Fish and Game's Natural Diversity Data Base list of Special Plants (1996). Hooker's manzanita is found on sandy soils, sandy shales, and sandstone outcrops from the Santa Cruz Mountains south to the Carmel area. The species has a very limited distribution over two U.S. Geological Survey quadrangles and is limited to small, localized populations in these areas (LSA Associates, Inc. 1993). On the site, Hooker's manzanita is found as a dominant or co-dominant species throughout the maritime chaparral (fig. 1). It is also found in regions where chaparral is grading into such communities as oak woodland, Monterey pine woodland, and Douglas-fir woodland.

Monterey spineflower (*Chorizanthe pungens* var. *pungens*) has been placed on List 1B by the CNPS and has a R-E-D code of 2-2-3. It is not listed by the State of California, but was determined by the federal government to have threatened status as of February 1994 (United States Department of the Interior, Fish and Wildlife Service 1994a). Monterey spineflower is found in coastal dune, coastal scrub, grassland, maritime chaparral, and oak woodland communities adjacent to the coast of southern Santa Cruz and northern Monterey counties and inland to the coastal plain of Salinas Valley (United States Department of the Interior, Fish and Wildlife Service 1994b). The vegetation survey conducted by CRI identified this species in the central canyon bottom, roughly 700 to 1,000 feet from the southern boundary of the property. Further field studies revealed approximately 300 plants in several open sandy areas of the same canyon (fig. 1).

This species has potential to occur in the oak woodland, coastal scrub, and maritime chaparral communities, but was not observed in these areas during field surveys.

California bottlebrush grass (*Elymus californicus*) is a CNPS List 4 species and has a R-E-D Code of 1-1-3. It is not presently listed by the State of California as endangered or threatened, but has been placed on the California Department of Fish and Game's Natural Diversity Database list of Special Plants (1996). The U.S. Fish and Wildlife Service has placed California bottlebrush grass in Category 3c (C3c), which identifies the species as being too widespread or not threatened at this time. In the vicinity of the project site, California bottlebrush grass has been reported growing in association with closed-cone pine and mixed evergreen (Douglas-fir) forests. LSA Associates, Inc. (1993) reports it growing within about 1 mile northwest of the site in five localized areas. The vegetation survey conducted by CRI identified this species on the northern portion of the site in the dense phase of the oak woodland (fig. 1).

Kellogg's horkelia (*Horkelia cuneata* ssp. *sericea*) has been placed on List 1B by the CNPS and has a R-E-D code of 3-3-3. It is not listed by the State of California, but is listed as C2 by the federal government. Kellogg's horkelia occurs in coastal sandy sites and in coastal dune scrub. It was found during the environmental audit at one location in the central canyon, roughly 700 to 1000 feet from the southern boundary of the property. Further field studies found plants at this and one additional location in the central drainage (fig. 1).

Sensitive Communities

The site contains several plant communities that are considered sensitive: San Andreas coastal live oak woodland, San Andreas maritime chaparral, and wetland sites (which include riparian woodland, freshwater marsh, and scattered/seasonal wetlands). The first two communities have been identified by Santa Cruz County as "habitats" of special local concern. We will use the term "community" to identify them.

San Andreas coastal live oak woodland, hereafter referred to as oak woodland, is considered a locally rare community in the Biotic Resources Section of the Santa Cruz County Growth Management Plan (Santa Cruz County 1977) and as a sensitive community type in the Santa Cruz County Local Coastal Program Land Use Plan (1982). It is often composed of almost pure stands of coast live oak (*Quercus agrifolia*) and is restricted to the sandy, infertile soils on hillsides and canyons north of Watsonville.

The oak woodland is the dominant vegetation type (68 percent) on the site and occupies the mesic slopes and canyon areas (fig. 1). Community structure varies over the site according to moisture and aspect. In many places the oak trees are large, sprawling, multiple-trunked trees that dominate the area. In a few areas that have been influenced by humans in the past, the oaks form a more open woodland with grassland and scattered shrubs as understory. Of the 193.4 acres on site, approximately 152 acres have been classified as "dense," 35 acres as "moderately dense," and 6 acres as "sparse." The dense phase is considered to be the climax community for the site. On the eastern portion of the site, the oak woodland has been degraded by disturbance and escaped ornamental exotic species such as Monterey pine (*Pinus radiata*). These areas no longer retain their original community complexity and structure.

San Andreas maritime chaparral, hereafter referred to as maritime chaparral, occurs along the windswept coastal hillsides and sand dunes of central and northern California from Santa Barbara to Santa Cruz County. It often forms a mosaic with oak woodlands and is a successional stage of that community. The maritime chaparral on site is considered a distinctive type of chaparral referred to by Santa Cruz County as "San Andreas maritime chaparral." It is dominated

by two species of manzanita: Hooker's manzanita (a CNPS listed plant) and Woolly manzanita (*Arctostaphylos tomentosa*). This community has a highly restricted distribution of approximately 209 acres (LSA Associates, Inc. 1993). Because of its unique species composition (i.e., Hooker's manzanita) and limited distribution, it is considered a sensitive habitat by Santa Cruz County. It represents 18 acres on the site (*fig. 1*) which is 8.6 percent of the total cover of this community type in Santa Cruz County.

Sensitive wetland sites consist of riparian woodlands, a freshwater marsh, and scattered intermittent wetlands. A total of 6.6 acres occur on the site. Section 5.2 of Santa Cruz County's General Plan seeks to protect, preserve, and restore riparian and wetland areas. Wetland areas are defined as transitional areas between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is covered by shallow water. Under a "unified" methodology now being employed by all federal agencies, wetlands are defined as those areas meeting certain criteria for hydrology, vegetation, and soils. Development in riparian and wetland areas is prohibited unless an exception is granted. Development is defined as any type of activity, including grading.

Riparian woodlands occur along the creeks that border the eastern portion of the site, around the manmade Rancho Reservoir and the drainage south of it, and along the canyon bottoms near the center of the site (*fig. 1*). Areas of riparian woodland large enough to be mapped occur on 5.12 acres of the site. Of this area, 0.56 acres are associated with Rancho Reservoir. Where pools of water occur along the site's drainages, small patches of freshwater marsh-type vegetation (0.5 acres) have become established and form a mosaic within the oak woodland and riparian woodland communities (*fig. 1*). The largest area of freshwater marsh covers is a result of the development of Rancho Reservoir. Several small areas of intermittent wetlands (2.1 acres) along some of the canyon bottoms and in other drainages are too small to be mapped individually. The area they occupy, however, is identified as a narrow corridor along the bottom of the central drainage (*fig. 1*). These areas receive surface flow only during the rainy season and are dry most of the year. As with the freshwater marsh, parts of the scattered intermittent wetlands may be an artifact of past disturbance.

Grading

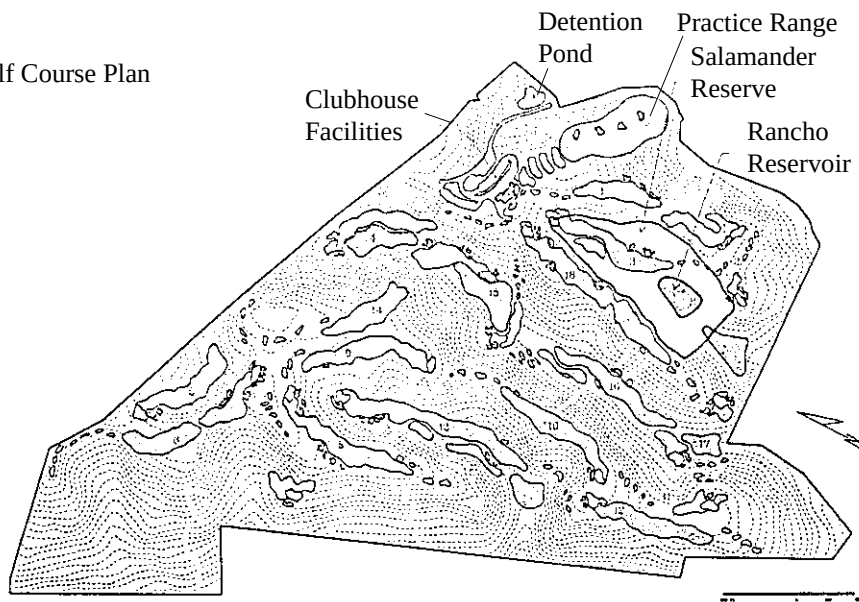
Grading is an important issue because of the site's varying topography, with several ridges and valleys traversing the site (*fig. 1*). The action alternatives would move between 450,000 to 950,000 cubic yards of earth. The magnitude and location of this activity can disturb drainage and the soil and vegetation that provide habitat for various species of plants and animals.

Alternatives

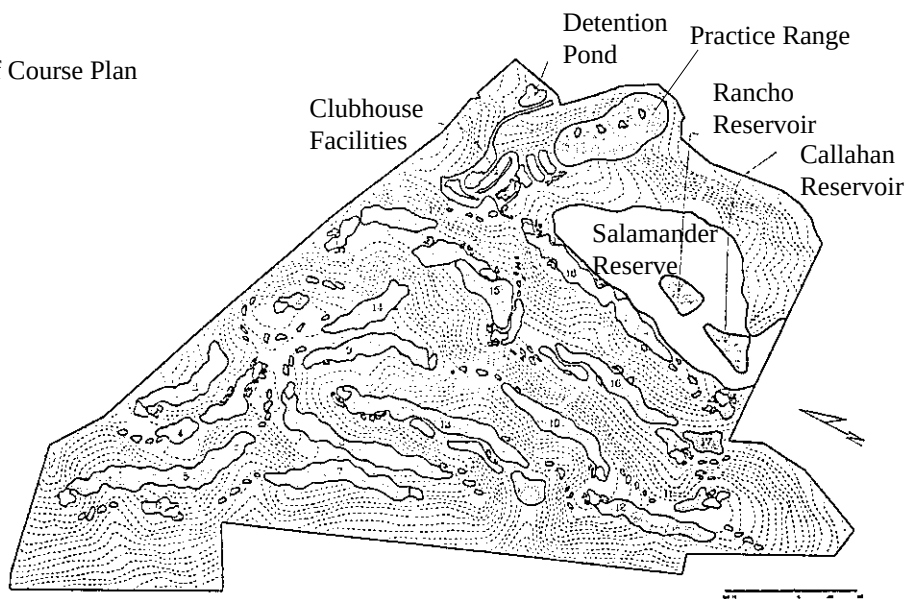
Five alternatives have been identified and assessed to provide a better understanding of the project's effects on the environment and to aid in developing the Conservation Plan. The alternatives are: No Project, three action alternatives (Alternatives 1, 2, and 3 [*fig. 2*]), and Alternative Sites. The goals, objectives, and philosophy for developing the site are consistent for all the action alternatives. The primary difference is in the golf course layout and its effect on the physical and biological resources of the site. Under all action alternatives, the Salamander Reserve would be monitored and managed as identified in the DHCP and specified in the Implementation Agreement.

The grading plan for the action alternatives identifies the maximum potential area that could be disturbed if implemented. Because it is not known what linkages (natural areas) within the grading footprint can be avoided, it is assumed

1: Golf Course Plan



2: Golf Course Plan



3: Environmentally Preferred Plan

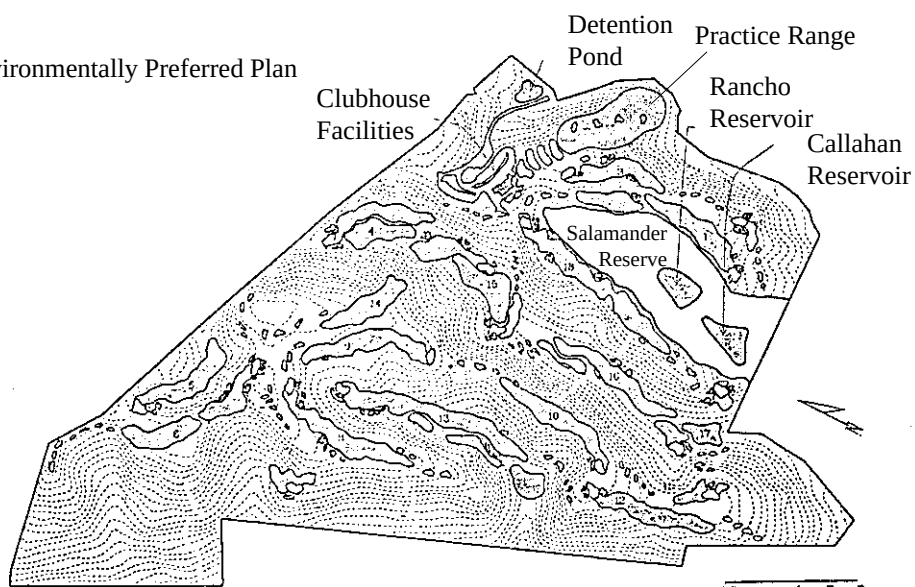
**Figure 2**—Alternative golf course plans.

Table 1—Comparative effects matrix

	No Project Alternative	Alternative 1	Alternative 2	Alternative 3
Santa Cruz long-toed salamander	– ¹	+ ² /–	+	+
Tiger salamander	–	+/-	+	+
Salamander Reserve				
Acres	0 ³	13.6	22.9	19.6
Percent		4.8	8.1	6.9
Monterey spineflower	– eliminated naturally	– eliminated induced	–/+	–/0
Kellogg's horkelia	– eliminated naturally	– eliminated induced	–/0	–/0
Hooker's manzanita	–	–	–/0	–/0
California bottlebrush grass	0	0	0	0
San Andreas Coastal Live Oak Woodland	0/–	–	–/+	–
Acres		83.3	109.6	82.3
Percent		43.0	56.6	42.6
San Andreas Maritime Chaparral	0/–	–	–/+	–
Acres		11.3	8.5	12.9
Percent		62.3	47.0	71.9
Wetland sites	0/–	–	–/+	–/+
Oak Preserve				
Acres	0	171.7	–/+	–/+
Percent		60.0	53.4	60.0
Grading				
Cubic yards	0	450,000	950,000	550,000
Acres	0	123.7	141.1	122
Percent		43.5	49.6	43.2
Golf course				
Acres	0	99.2	109.7	94.2
Percent		34.9	38.6	33.1

¹Negatively impacted²Beneficially impacted³No impact

that the entire area will be disturbed. The following narrative presents the effects of the action alternatives, and *table 1* summarizes these effects for all the action alternatives.

The No Project Alternative provides baseline information for the comparative analysis among action alternatives. For this alternative, a projection of the natural successional processes as interpreted from the analysis of the physical and biological resources of the site is assumed. Development pressure in the area and region is forecasted. This alternative would leave the site as privately owned

open space with one residential unit. Land would not be dedicated to and managed for the SCLTS, TS, and other resources of the site, or be protected from local uses and potential urban expansion.

Alternative 1, the original layout, was designed before CRI involvement and was considered environmentally sensitive to the land form and oak woodland community (*fig. 2*). Other aspects of the biological and physical landscape were not considered because a complete on-site resource environmental audit had not been completed. The SCLTS was known to exist on the property, and a habitat (13.6 acres) identified as necessary for its protection would be established as the Salamander Reserve. Some of the reserve would be lost to a fairway and associated tees. No active resource management of the various plant communities outside of the Salamander Reserve is proposed. Under this alternative, 123.7 acres (450,000 cubic yards) would be graded to create a 99-acre golf course, and a Conservation Plan would not exist.

Alternative 2 reflects a design that responds to the environmental audit and concerns identified by the various regulatory agencies (*fig. 2*). Under this alternative, the natural resources (biological and physical) of the site are an integral part of the golf course design; however, they are not integrated into a comprehensive plan. Primary consideration has been given to avoiding or minimizing negative effects to the salamanders of concern. A buffer strip on the outer perimeter of the Salamander Reserve would be constructed to discourage egress. The Salamander Reserve area could be enhanced by stabilizing erosion, removing exotic plants, and adding 9.4 acres to the minimum habitat identified as necessary to protect the salamanders. The addition would serve as potential breeding and dry-season refuge sites. An Oak Preserve would be established to protect and conserve the natural biological resources of the site that were not part of the Salamander Reserve or golf course. Under this alternative, 141.1 acres (950,000 cubic yards) would be graded to create a 109.8-acre golf course.

Alternative 3 is similar to Alternative 2, but emphasizes the interdependence of the Salamander Reserve, Oak Preserve, and the golf course as a sustainable unit (*fig. 2*). The natural resources of the site become a functioning part of the golf course design and are preserved and managed in perpetuity through enactment of the Conservation Plan. Primary consideration has been given to avoiding or minimizing negative effects to the animals, plants, and habitats of concern. As in Alternative 2, no human activities that would negatively affect the salamanders would be allowed, erosion would be stabilized, exotic plant species eliminated, and area (6.0 acres) would be added to the Salamander Reserve as potential breeding and dry-season refuge sites. Under this alternative, 122.9 acres (550,000 cubic yards) would be graded to create a 94.2-acre golf course.

Four alternative sites were assessed before selecting the present site for development. The criteria employed in assessing the suitability of each site for golf course development included location within the County, distance from urban development, adequacy of acreage for an 18-hole course, land costs, development constraints, access, topography, and view.

Alternative Effects

The following describes the effects of the alternatives on the site as interpreted by the interdisciplinary research team (*table 1*). The Alternative Sites analysis was excluded.

For the No Project Alternative, residential development, based on existing conditions, could be limited to as few as five single family units. This number of housing units would not significantly affect the natural resources of the site. Erosion, in the Rancho Reservoir area, if gone unchecked, could cause the

extinction of the SCLTS and TS within 20 years. Monterey spineflower and Kellogg's horkelia are early successional species and would be replaced by encroachment of adjacent plant communities. Hooker's manzanita, a main component of the maritime chaparral, is dependent on periodic fire and open exposure for survival. California bottlebrush grass is likely to remain on the site as long as the oak woodland community is present. The sensitive plant communities would continue their natural successional process, harmed mostly by competition with exotic species, erosion, and fire suppression. The property is dominated by dense oak woodland which is considered the climax community on the site. If undisturbed, it would remain dominant over time because individual coastal live oak trees can easily live hundreds of years and community change is gradual. Maritime chaparral is in an early successional stage to the oak woodland and is likely to be replaced by it. Both the oak woodland and the maritime chaparral communities on the eastern third of the site would be harmed by competition and shading from planted invasive species (Monterey pine, acacia, eucalyptus, and pampas grass). Invasive plant species are also present adjacent to Rancho Reservoir (pampas grass, French and Spanish broom) and in some of the riparian woodlands (German ivy). If not controlled, these species could continue to spread at the expense of indigenous vegetation. The freshwater marsh in Rancho Reservoir and the scattered seasonal wetlands in the central drainage would turn into upland communities at the present rate of erosion. The riparian woodlands, however, appear to be stable.

The three action alternatives differ primarily in juxtaposition and size of the golf course, the Salamander Reserve and Oak Preserve, and in the management strategies associated with each. The following narrative distinguished the more substantive issues associated with each of the major issues.

The Salamander Reserve is affected for all action alternatives. For Alternative 1, approximately 5.3 acres of critical dry-season refuge sites within and not including the Salamander Reserve (13.6) would be lost to a fairway and associated tees. A 20-foot buffer strip internal to the Salamander Reserve would be planted with native shrubs and annuals to prevent erosion from overland flow and discourage human encroachment. This activity would disrupt dry-season refuge sites. Rancho Reservoir would be enhanced to retain water throughout the year which would allow greater reproductive success during low rainfall years but could attract aquatic salamander predators. Alternative 2 is similar but is directed at maximizing benefits for the salamanders. The Salamander Reserve would be increased to 23.0 acres; no acreage would be lost to the golf course design; a 20-foot external buffer would be established; the reservoir would retain water only during the breeding and juvenile season and would be allowed to remain dry during the remainder of the year, and a secondary breeding pond would be constructed to encourage population expansion. Areas disturbed through the creation of a new pond would be revegetated to enhance the availability of dry-season refuge sites. Alternative 3 is similar to Alternative 2 with the following changes: the Salamander Reserve would be 19.6 acres; the golf course area juxtaposed to the Salamander Reserve would be landscaped to prevent erosion from overland flow; no external buffer strip (signs would be erected to explain the reserve and its functions); water levels in new breeding reservoir would be adjusted by mechanical means to correspond to those in Rancho Reservoir (water would come from groundwater wells); and revegetation of any disturbed areas would be with species that are found in the Salamander Reserve. Field research identified 2.85 acres as the minimum known habitat for the adult SCLTS on site, and 12.5 acres as potential habitat. It was estimated that, by increasing the size of the reserve to 19.6 acres, the adult salamander population would not be significantly affected. However, the perimeter of the juvenile movement was not determined, because almost 70 percent were found in the outer ring of the

pit-fall traps. This suggests that the juveniles may move beyond the established reserve border.

The four plant species of concern would be affected to one degree or another by each of the alternatives. The Monterey spineflower and Kellogg's horkelia present in the central drainage would be eliminated by fairway construction or through plant succession. Hooker's manzanita could potentially be eliminated in all areas of maritime chaparral or moderately dense oak woodland that come under the grading plan acreage, or replaced through plant succession to the oak woodland climax. For Alternative 3, a management plan has been developed that includes periodic prescribed burning which will benefit the Oak Preserve. The transect location where California bottlebrush grass was found is located within the grading plan. This area would be flagged and construction would be prohibited. This species is likely to remain on the site as long as oak woodland habitat is preserved.

The effect of the golf course on the plant communities is a function of grading. The impact on the oak woodland and maritime chaparral are adequately presented in *table 1*. The wetland areas, because of their location and small size, present a different situation. For Alternative 1, all of the intermittent wetlands (approximately 2 acres) and 2.5 acres (48.8 percent) of the riparian woodlands are within the grading plan and would be lost. One acre of the scattered intermittent wetland area would be restored. The freshwater marsh would be altered through enhancement of Rancho Reservoir in the Salamander Reserve. Although this alternative identifies 8.9 acres of ponds for the visual esthetics of the site, these would not be managed as wetland habitat under this alternative. Alternative 2 would disrupt 3.4 acres of the wetland areas, and remove approximately 99.0 percent of the scattered intermittent wetlands. The latter habitat would be replaced with open intermittent wetlands and more permanent riparian habitat during construction. All riparian woodland would be preserved or enhanced. The freshwater marsh would experience no disturbance. Restoring and revegetating 4.7 acres to open freshwater marsh and wetland types would result in a net gain of 1.3 acres (16.5 percent). Alternative 3 has potential to benefit all wetland sites. Areas of riparian woodland would be preserved or enhanced. The woodland site below Rancho Reservoir would become part of the Salamander Reserve and be developed into a riparian woodland for salamander breeding. The freshwater marsh on the site would experience no disturbance. It would be enhanced for salamander reproduction through the restructuring of the subsurface to prevent rapid percolation of rainwater. The pond would be augmented if necessary during the breeding season and allowed to dry out thereafter.

The Site Conservation Plan

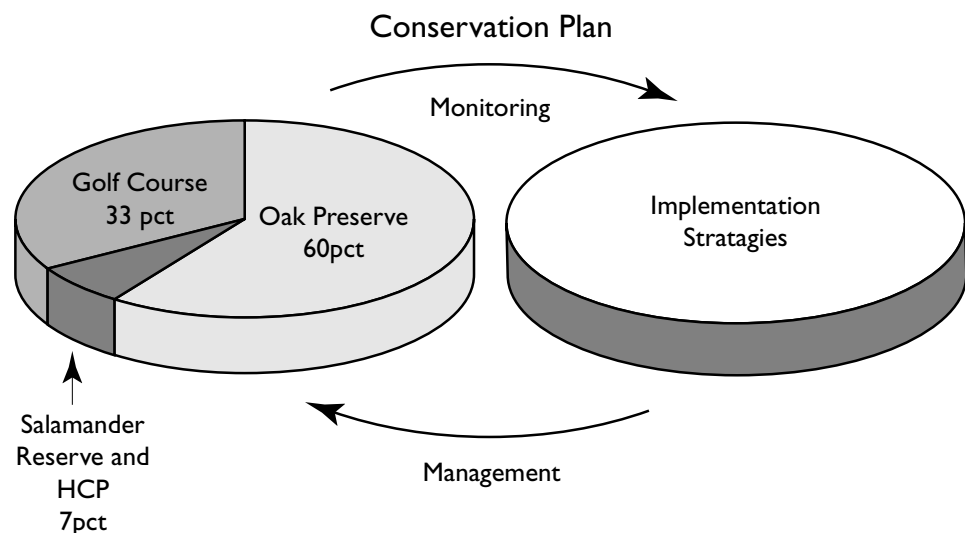
The Conservation Plan (Plan) is an approach to managing the living landscapes of the BVCC site by addressing the needs of different species and communities that are common to the site's biological system through time. The goal of the Plan is to maintain the integrity of the oak woodland and associated plant communities and the Salamander Reserve while operating an 18-hole target golf course. Management of the broader landscape, as opposed to the affected area, in a manner compatible with the needs of the listed species and communities, will more likely add to the survival of the biological system than species-specific management. The Plan attempts to use the fairways, greens, and target areas as open space and linkage among the golf course, Oak Preserve, and Salamander Reserve. The recreational area serves as the linkage to undisturbed natural habitat and may provide an acceptable approach to the dilemma of managing endangered species and sensitive habitat at the site. Management that can

annually adapt its implementation strategies to the site on the basis of updated scientific information obtained from monitoring the major components is key to the successful execution of the Plan.

An interdisciplinary team of scientists, resource managers, and analysts from CRI conducted a natural resources inventory of the site. The inventory, topographic information, and the original golf course design served as the data base for the assessment. GIS was used to evaluate the effects associated with various alternative 18-hole golf course scenarios. From this analysis it became apparent that a holistic integrated approach to planning and management would be necessary if the development was to exist in harmony with nature. The interdisciplinary team identified two action alternatives that met the developers' objectives and would least affect the site resources. These action alternatives attempted to integrate the issues and concerns identified by the regulatory agencies, the physical constraints of the landscape, the biological requirements of the organisms of concern, and the goal of developing an 18-hole target golf course into one site plan. Alternative 3 appeared to be the only alternative that lent itself to an integrated Plan. The major components of the Plan include the Salamander Reserve (DHCP and Implementation Plan), the golf course, an Oak Preserve, monitoring program, implementation strategy, and adaptive management for the entire site. Implementation strategies would develop annually as a result of analyzing the interactions of the major components (*fig. 3*). To ensure that the components are consistent with the goal, the Plan would call for overseeing the implementation of the golf course design, creation of the Salamander Preserve and Oak Reserve, and the perpetual management of the three components as one site through time.

Alternative 1 did not accomplish the requirements of the Plan. Although it has a Salamander Reserve and golf course plan, these were developed as independent non-integrated components. Management of the oak woodlands would be a function of the site manager with no formal policy directives in place. Each component would be managed independent of the others. Alternative 2 is a major redesign of the golf course in an attempt to maximize the size of the Salamander Reserve and minimize losses to the San Andreas Maritime Chaparral (Hooker's manzanita). It identifies specific management strategies for each of the three components which includes a fire management program to prevent the extirpation of the maritime chaparral by fire suppression. The draw-back to this strategy is that 49.6 percent of the site would be graded with the movement of 950,000 cubic yards of earth. With this amount of site alteration it was assumed

Figure 3—Conservation Plan diagram.



that the integrity of the system would be lost. Alternative 3 was developed to meet the intent of the Conservation Plan. This alternative seemed to provide all the positive attributes of Alternative 2 without the massive detrimental effects of grading and site alteration. It was believed that by reducing the grading and compromising on the Salamander Reserve and maritime chaparral that the integrity of the biological systems could be maintained. In particular, the greatest threat to the salamanders would be the loss of the breeding reservoir and the destruction or disturbance of the contiguous dry-season habitat. The greatest threat to the San Andreas maritime chaparral would be the loss of fire for regeneration while the Oak Preserve would mostly be threatened by the loss of spatial continuity or linkage. The Plan addresses these issues.

The Conservation Plan identifies elements of the three components that would require annual monitoring to maintain the integrity of the system. Success criteria for meeting site objectives and means of revising the implementation strategies to ensure that the success criteria are met would be developed in cooperation with the various regulatory agencies before construction or upon approval of the project. *Figure 3* illustrates the conceptual design of the Plan. It is apparent that 67 percent of the site would not be disturbed. That monitoring of the major components would lead to refinement of the implementation strategies by increasing the understanding of the biological process on site and the consequences of applied management. The strategies would be improved annually on the basis of new information. However, the application of resources management theory beyond the species and community level is still evolving. Thus the Plan should be viewed as a hypothetical means to achieve a "development in harmony with nature." It is prudent to ask, "Will it work?" The answer will come with analysis of monitoring data and evaluation of the applied management program for the Plan, if it is allowed to proceed.

References

- California Department of Fish and Game. January, 1996. **Natural diversity data base**. Special plant list. Quarterly publication; Sacramento: California Department of Fish and Game; 74 p.
- LSA Associates, Inc. 1993. **Biological resources Buena Vista Property, Santa Cruz County, California**. Santa Cruz, CA: LSA Associates.
- Santa Cruz County, Community Resources Agency, Office of Resources Planning, 1977. **Technical Section**; Biotic Resources Section of the Santa Cruz County Growth Management Plan. Prepared by S.E. Singer, Watershed Analyst, Community Resources Agency, Santa Cruz County, California. 51 p. and appendix.
- Santa Cruz County, Planning Department, 1980. **County of Santa Cruz General Plan**.
- Santa Cruz County, Planning Department, 1982. **Santa Cruz County Local Coastal Program Land Use Plan (Final)**. 222 p. and amendments.
- Shaffer, H.B.; Stanley, S. 1992. **Final report to California Department of Fish and Game; California tiger salamander surveys, 1991—contract (FG 9422)**. Rancho Cordova, CA: California Department of Fish and Game, Inland Fisheries Division.
- Stebbins, R.C. 1985. **A field guide to western reptiles and amphibians**. 2d ed., revised. Boston: Houghton Mifflin Book Co.; 336 p.
- United States Department of the Interior, Fish and Wildlife Service. February 4, 1994a. **Rules and regulations**. Federal Register 59(24) 5499-5510.
- United States Department of the Interior, Fish and Wildlife Service. March 7, 1994b. **Endangered and threatened wildlife and plants; endangered status for three plants and threatened status for one plant from sandy and sedimentary soils of central coastal California**. 50 CFR Part 17.

