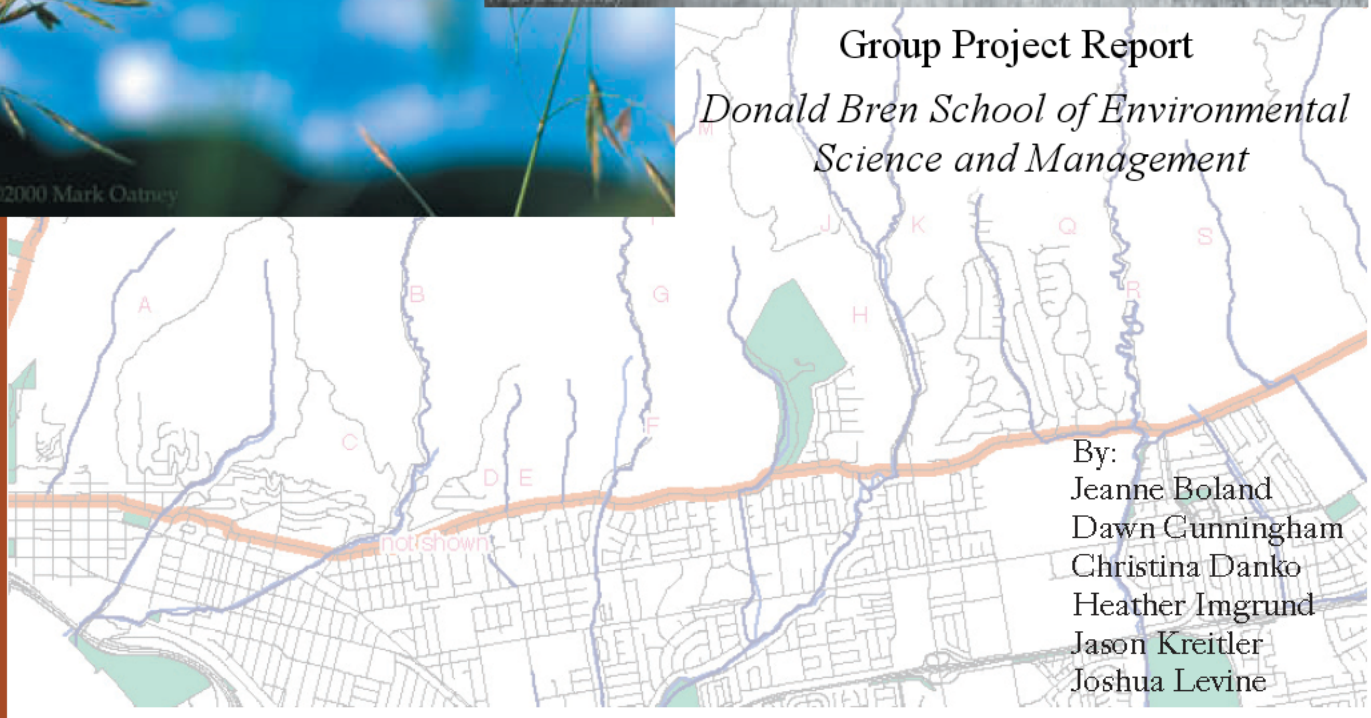
Classifying Sites in the Ventura Hillsides for Acquisition by the Ventura Hillsides Conservancy

Group Project Report

Donald Bren School of Environmental Science and Management



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CLASSIFYING SITES IN THE VENTURA HILLSIDES FOR ACQUISITION BY THE VENTURA HILLSIDES CONSERVANCY

A group project submitted in partial satisfaction of the requirements for the degree of Master of Environmental Science and Management for the Donald Bren School of Environmental Science and Management.

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As authors of this Group Project report, we are proud to archive it on the Bren School's website such that the results of our research are available for all to read. Our signatures on the document signify our joint responsibility to fulfill the archiving standards set by the Donald Bren School of Environmental Science and Management.

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The mission of the Donald Bren School of Environmental Science and Management is to produce professionals with unrivaled training in environmental science and management who will devote their unique skills to the diagnosis, assessment, mitigation, prevention, and remedy of the environmental problems of today and the future. A guiding principle of the School is that the analysis of environmental problems requires quantitative training in more than one discipline and an awareness of the physical, biological, social, political, and economic consequences that arrive from scientific or technological decisions.

The Group Project is required of all students in the Master's of Environmental Science and Management (MESM) program. It is a three-quarter activity in which small groups of students conduct focused, interdisciplinary research on the scientific, management, and policy dimensions of a specific environmental issue. The final Group Project report is authored by MESM students and has been reviewed and approved by:

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Abstract

Land trusts are becoming an increasingly popular means of achieving land conservation. There are currently over 170 land trusts operating in the state of California. These non-profit organizations have managed to preserve, through acquisition or easement, approximately 1.5 million acres (Land Trust Alliance, 2003). However, despite this achievement, land development in California is projected to outstrip land preservation for years to come (Press, 2002). One such organization, the Ventura Hillsides Conservancy (VHC), seeks to acquire parcels of land within the Ventura hillsides to preserve open space, conserve natural habitat, and provide access to the public for recreation and education.

We developed a planning support system to assist the VHC in acquiring parcels of land within the Ventura hillsides, according to their goals. Our method involved evaluating the physical and biological characteristics of the VHC's Priority Acquisition Area through a set of defined criteria to determine which parcels best fit their conservation goals. Since all of the Ventura hillside area is under private ownership with limited access, we relied on aerial photography, topographic maps, and existing trails and road networks. With ESRI's ArcGIS software, we scored the land to determine which areas of the hillsides have the greatest resource value. In addition, we provided other decision tools, including a checklist and a portfolio analysis, to account for other factors such as socio-economic considerations and the combined value of acquiring multiple parcels.

Executive Summary

The Ventura hillsides represent one of a few areas in and around the City of Ventura where natural open space exists. In recent years, the Ventura hillsides have experienced increasing political pressure for development. Since 2001, three ballot measures have demonstrated the political landscape in which landowners, developers, and the public have voiced their opinions about the future of the area.

One of these ballot measures, Measure A of 2002 or the Open 80 Master Plan Act, would have approved a Development Agreement to develop 1,390 new homes on 730 acres of the Hillside Voter Participation Area. After Ventura voters defeated Measure A in 2002, a group of citizens was inspired to take action by creating an organization with the goal of acquiring hillside property for permanent preservation as open space. This group established the Ventura Hillsides Conservancy (VHC) in 2003. The mission of the conservancy is to "preserve the hillsides, canyons, and open space that contributes to the unique character and natural environment of the City of San Buenaventura and the surrounding region for the benefit of present and future generations."

The VHC's goal is to acquire hillside land so that protection can be afforded to areas with three types of resource values: 1) Biological Resources (native plant or wildlife value, native habitat value, and restoration potential); 2) Recreational Resources (public access, trail connectivity, and interpretive value); and 3) Scenic Resources (ridgelines, viewsheds, and vistas). The objective of the Bren project was to classify sites within the hillsides for the three resource Rubrics.

To accomplish this, we created a Criteria Scoring System that we modeled after The Nature Conservancy's method of scoring and ranking conservation targets and the biodiversity health of sites (TNC, 2000). For each resource Rubric, we developed detailed criteria that would assist us in evaluating sites within the hillsides. The criteria for the three Rubrics were formulated after research and consultation with the VHC and professionals in the conservation field. The Criteria Scoring System provides a numerical score for each criterion, ranging from 1 to 4, with 4 having the highest resource quality and 1 having the lowest resource quality. The average of all criteria scores within a Rubric provided a total Rubric score. These numerical scores can be translated as high resource value to low resource value (4 to 1).

To complete our evaluation of the criteria, we first created a vegetation map of the VHC's Priority Acquisition Area (PAA). Aerial photographs, taken in July 2002, served as the base line for map generation. In addition, we incorporated city roads, city and property boundaries, a digital elevation model (DEM), and a wetlands map into a Geographic Information System (GIS) database. We also created a trail map that reflected the presence of existing roads and trails within the hillsides. After evaluating the criteria for each of the three Rubrics, we assigned scores to shapefiles within the GIS. These shapefiles consisted of habitat polygons, buffered trails, and 25-acre viewshed units, which cover the three resource Rubrics we were evaluating (biological, recreational, and visual resources).

Since planners in the United States measure the land in acres, we chose to evaluate the land acre by acre. To do this, we used ArcGIS to convert our scored habitat polygons, buffered trails, and 25-acre viewshed units to one acre rasters (grid cells). The grids for each Rubric were then overlaid to view the scored resources for all three Rubrics together.

We used a simple additive weighting procedure to combine the three Rubrics. The weighted overlay function of ArcToolbox allowed us to weight all Rubrics equally, yet design a system that would allow the VHC to change the Rubric weights to meet their future demands. This characteristic makes our model robust for future use. We provided the VHC with an example and tutorial of the model separately from this report.

Our scoring results for the one-acre rasters were displayed on maps of the VHC's PAA, showing areas with a score of 4 in green, 3 in yellow, 2 in orange, and 1 in red. The maps we created show varying levels of detail. First, we provided maps that illustrated the scoring distribution for each of the criteria under the three resource Rubrics. Second, we provided maps that illustrated the average of the criteria scores under each of the three Rubrics (maps of biological, recreational, and visual resources). Finally, we provided maps that illustrated the scoring distribution for the three Rubrics combined. In each of these instances, the highest scoring areas (scores of 4 and 3 designate higher quality) mainly occurred along the frontal slopes, adjacent to the city limits.

Initially our scoring results displayed the scoring distribution on a 1-acre raster level; however, we also saw the usefulness in providing scores on the parcel level, since this is the scale at which the VHC will make acquisition decisions. In order to distinguish parcels with the best resource values, we classified parcels into the top, middle, and bottom 33 percent. To classify parcels into these categories, we first needed to assign each parcel a score. To do this we first calculated the area, in square feet, for each score that a parcel received from the combined raster classification of the three Rubrics. Using these "score areas," parcels were classified using four scoring methods: 1) average score method (averaging scores across the parcel), 2) added weight score method (giving higher scores a greater weight), 3) maximum score method (assigning a parcel the maximum score that occurred within its boundary), and 4) minimum score method (assigning a parcel the minimum score that occurred within its boundary). Averaging the value of resources over large areas provides only a very general description of the resources present. Many important details can be lost in the general description. For example, a high quality but small resource can be hidden in the process. By using four scoring methods, fewer details are lost in the process and more comprehensive results are provided.

The average score method and added weight score method provided nearly identical results. Squaring the scores to add weight to high scoring acres in the averaging process did not result in an outcome different from the average method results with no weight added. The average method results allow the VHC to easily view the parcels where the top, middle, and bottom ranked resources are located. We also provided lists of the maximum and minimum scores within each parcel to be used for comparison. In addition, our results illustrated that parcels classified into the top 33 percent are primarily located in the frontal hills, while parcels that were classified into the bottom 33 percent are primarily located in areas that contain oil exploration and development or agricultural resources.

Although the Criteria Scoring System, would allow the VHC to make informed acquisition decisions based upon the resource quality of sites, the process of acquiring parcels is dynamic, and cannot simply be achieved by acquiring the single "best" collection of parcels, based exclusively on resource value. Social, political, and economic issues, threat of development, and opportunity are all factors that must be considered when formulating an acquisition strategy. Therefore, a scoring system alone will not suffice to provide the VHC with the ability to make effective acquisition decisions.

In addition to the scoring system, we also performed a Portfolio Analysis that takes into account the benefits of acquiring a parcel adjacent to another already acquired parcel. For example, while a parcel by itself may not have any biological value, it may serve as an important connector between two parcels that have significant biological value. If a parcel of low resource value becomes available, the VHC can justify acquiring this parcel if it will serve an important part of a future portfolio. Our rationale for performing the Portfolio Analysis was to take into account the value of sites from a system perspective, since viewing individual sites might not provide a complete picture of the cumulative resource value of groups of sites. Therefore, we provided our recommendations for groups of parcels that provide habitat connectivity, trail connectivity, and viewshed connectivity. We selected parcels within a portfolio by locating high scoring sites and determining which parcels would maximize the connectivity of high scoring sites if acquired as a group.

Lastly, we developed a Parcel Checklist, modeled after the checklists used by the Land Trust for Santa Barbara County (2003). The Checklist establishes the minimum requirements for parcel acquisition, both legally and according to the VHC's long-term goals. The checklist will also allow the VHC to account for future factors such as opportunity or threat. For example, even if a project scores high in our classification system and is part of an ideal portfolio, the VHC may decide not to pursue it because of lack of public support, timing, or other practical considerations. If a parcel falls short of the minimum criteria established in the Parcel Checklist, then we recommend that it not be acquired. The Parcel Checklist also includes other considerations or unknown variables that need to be taken into account, based upon the timing of the acquisition or additional coinciding events. Additionally, the Parcel Checklist can be used as a safeguard when evaluating a potential acquisition to ensure that the property is free from hazards and liabilities and has an acceptable purchase price.

In summary, the VHC will have three different tools with which to make acquisition decisions: 1) Criteria Scoring System, 2) Portfolio Analysis, and 3) Parcel Checklist. This framework for making acquisition decisions is a systematic process that the VHC can employ when a parcel becomes available. With this framework, the VHC's decisions will be well-informed by taking into account a variety of factors, including scientific, social, and economic considerations.

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1. Introduction

1.1. History/Background

The Ventura hillsides represent one of few areas in and around the City of Ventura where natural open space exists. The hillsides have been impacted by historical activities such as oil development, agriculture, cattle grazing, and expanding human population growth. Exotic species have invaded the area partly because of these disturbances. In addition, much of the viewshed has been degraded as a result of development and continues to be threatened by population growth and urban sprawl in Ventura.

Threat of Development

Starting in the 1970's, increasing urban encroachment pushed orchard and housing developments up into the hillsides. The fast conversion of rangeland and watershed land to orchards and housing developments has significantly contributed to an increase of soil and water conservation problems for the city. As of 2004, approximately 104,000 people reside in the City of San Buenaventura (Ventura-usa.com, 2004). As the city's population continues to expand, so has the local desire to protect open lands for recreational purposes, unique habitats, and watershed improvement.

In recent years, the Ventura hillsides have also experienced increasing political pressure for development. Since 2001, three ballot measures have demonstrated the political landscape in where landowners, developers, and the public have voiced their opinions about the future of the area. These ballot measures are Measure P, 2001; Measure A, 2002; and Measure A, 2004.

Measure P passed in 2001 by voters, applies to a 9,000-acre area of the Ventura hillsides outside the city limits. The measure requires voter approval prior to the extension of city services to any land within the "Voter Participation Area." Because of Measure P, hillside landowners campaigned to place Measure A on the ballot in 2002.

Measure A of 2002 or the Open 80 Master Plan Act, which was defeated and would have amended the City's Comprehensive Plan, amended City land use regulations, and approved the Open 80 Master Plan. It would have also approved a Development Agreement to develop 1,390 new homes on 730 acres of the Hillside Voter Participation Area. Furthermore, the measure would have set aside 3,050 acres of open space as part of the Open 80 Master Plan. Since the measure would have been enacted by a voter initiative and not a discretionary government action, the environmental review requirements of the California Environmental Quality Act (CEQA) would not have been triggered.

Measure A of 2004 was a measure that would have created the Ventura County Regional Open Space District. In addition, the ordinance would establish a 0.25 percent sales tax in Ventura County for the purpose of agricultural land preservation and acquisition of open space land. Measure A of 2004 did not pass (League of Woman Voters California, 2005).

Ventura Hillsides Conservancy

After Ventura voters defeated Measure A in 2002, a group of Ventura citizens was inspired to take action by creating an organization with the goal of acquiring hillside property for permanent preservation as open space. This group of citizens established the Ventura Hillsides Conservancy (VHC) in 2003. The VHC operates as a nonprofit 501(c) (3)-land trust with the purpose of acquiring hillside land or easements for preservation, restoration, and open space. The mission of the land trust is to "preserve the hillsides, canyons, and open space that contributes to the unique character and natural environment of the City of San Buenaventura and the surrounding region for the benefit of present and future generations."

Once the VHC acquires the land, it plans to not only protect and restore wildlife and plant communities, but also to ensure public access. All visitors to the hillsides will be able to enjoy scenic trails with views of places such as the Channel Islands and the Topa Topa Mountains.

VHC's Interest Area

VHC's Interest Area encompasses 50,600 acres in the Ventura hillsides. Within its Interest Area, the VHC has identified a Priority Acquisition Area (PAA) of approximately 18,600 acres located in the southern portion of the Interest Area. The PAA spans a range that is approximately 10 miles long and 4 miles wide. This extent is from Taylor Ranch in the west and along Foothill Road to Rancho Vista Lane in the east. All except approximately 215 acres of the study area is located outside the city limits and is adjacent to the city of Ventura's current residential boundary (Figure 1).

Currently, most of the land is under the jurisdiction of Ventura County. However, the land is a combination of the City of Ventura's Interest Area and the City of Ventura's 1989 Planning Area. Most of the land in VHC's Interest Area is privately owned and public access is prohibited.

One of the most striking aspects of the PAA is its adjacency to the Ventura River. The River runs north south from the Topa Topa Mountains to the Pacific Ocean and several tributaries funnel into the main basin from the east and west (U.S. Department of the Interior, n.d.). At one time in the past, the Ventura River supported one of the largest runs of endangered southern steelhead trout on the south coast (Baiocchi, 1998).

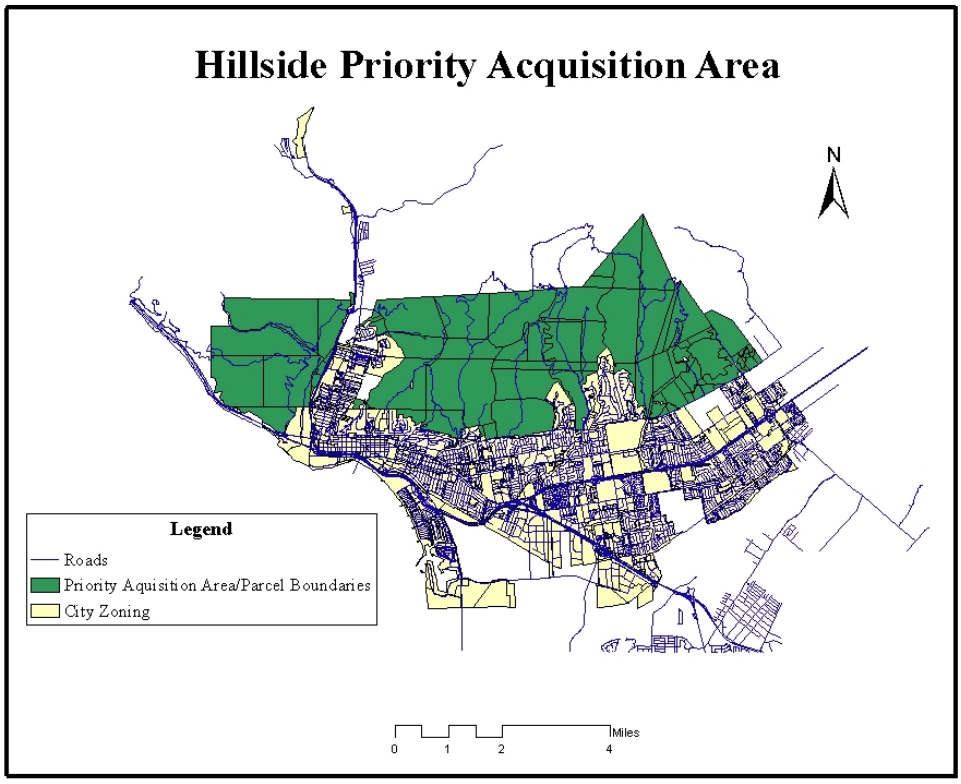


Figure 1. The VHC's Priority Acquisition Area in the Ventura Hillsides.

1.2. Problem Statement

The VHC intends to acquire hillside land to be permanently set aside to protect areas in the hillsides that provide: 1) Native Plant or Wildlife Value, Native Habitat Value, and Restoration Potential; 2) Public Access and Recreation; and 3) Scenic Resources, such as ridgelines, and viewsheds. If the VHC acquires the land, management practices can be incorporated to improve upon the habitat quality of the land and the viewshed, as well as provide areas for public recreation. The goal of the project is to describe the attributes of the hillsides using a classification scheme based on 1), 2), and 3) above. Supplementing the parcel classification, a portfolio analysis, and a checklist are provided to assist the VHC in making future acquisition decisions (Appendix 4.5, 5.1, and 5.2).

2. The Ventura Hillsides

2.1. Historical Land Use

The first humans to use the abundance of materials found in the hillsides were the Chumash Indians, who used tar and oil for a multitude of purposes. For example, they used tar to

fasten decorative shells and waterproof their baskets. Later, travelers through the San Joaquin Valley lubricated their wagon wheels as they passed natural oil seeps.

Economic interest in oil and gas seeps in Ventura County did not begin until the 1850s. In 1854, oil from seeps and excavations at Sulphur Mountain was refined for home use. This instigated the construction of a refining plant near Ventura in 1861 by G. S. Gilbert to refine asphaltum from the Ojai Ranch on a commercial basis. Later, Josiah Stanford, a mining engineer, dug many tunnels into Sulphur Mountain and became one the top oil producers of the time. Thomas R. Bard drilled the first commercially productive California oil well in 1866 on the Ojai Ranch. His well, Ojai 6, produced 15 to 20 barrels of oil per day. In 1866, stills were resurrected along Santa Paula Creek, and in 1883, Lyman Stewart and Wallace Hardison formed Hardison & Stewart Oil Company. This preceded the 1890 merger of Hardison & Stewart Oil Company, the Sespe Oil Company, and the Torrey Canyon Oil Company into Union Oil (Provident Energy Trust, n.d.). In 1892, Union Oil Company's well No. 28 hit oil and was uncontrollable. Oil ran down Adams Canyon into the Santa Clara River and on into the ocean (Provident Energy Trust, 2004).

Oil exploration and capture in the County was, and still is, extensive with landscape altering effects. As a result, large areas of habitat have been fragmented and destroyed. Furthermore, a number of waste and oil sumps used for storing oil were covered and abandoned. For that reason, it is hard to determine the extent of environmental externalities that maybe present among the hillsides.

Successful cattle grazing and agricultural practices have also been carried out on the hillsides. In 1810, there were 21,221 cattle, 3,276 horses and mules, and 8,543 small stocks, with an average crop for the decade of 6,400 bushels. The high productivity coincided with the San Buenaventura mission-founding ceremonies commenced by Father Junipero Serra on March 31, 1782 (Access Genealogy, 2005).

Mexico secularized the Californian missions in 1833, and the hillsides became the property of Dr. Manuel Antonio Rodriguez de Poli and were later subdivided. It was during this time that the hillsides were seen as worthless, and were eventually purchased in 1902 by George Grant, the local blacksmith. Grant used the property primarily for sheep grazing (Steve Cummings, personal communication, July 2004). Simultaneously, walnuts and apricots were introduced to the Ventura Valley and were the major crops until lima bean farming became more profitable. Afterwards, the main money crops became lemons, strawberries, avocados, and Nursery Stock. In addition, growers discovered that high-quality lemons could be grown, which shortly spurred the creation of Sunkist in 1893 (Sunkist, 2004).

2.2. Biological Resources

Ventura County has a temperate, Mediterranean climate where the average temperature is approximately 74 degrees Fahrenheit (Ventura-usa.com, 2004). The hillsides are part of the Santa Ynez Mountains system and are composed of a small subset of transverse coastal ranges that runs predominately east-west adjacent to the Ventura River and the Santa Clara basin. They are situated directly north of the City of San Buenaventura and southeast of the

Ventura oil fields, which are located at the base of Sulphur Mountain's Cañada Larga O Verde. The hillsides are contiguous to the Ventura River and the Santa Clara River watersheds. Additionally, the hillsides contain Ventura River watershed drainages that include riparian resources. These watersheds connect the hillsides to the Pacific Ocean and make them an important resource to the coastal area (California Coastal Conservancy, 2004).

The vegetation on the hillsides is typical to the region's geology, soil type, climate, and slope aspect. Seven dominate vegetation series have been identified (from aerial photos) on the Ventura hillsides: coast live oak woodland and savanna, California sagebrush, purple sagebrush, coyote brush, California annual grassland, sumac, and mulefat. In addition, three other series may be present such as blue elderberry, giant wild rye, and cactus series. However, they are too difficult to distinguish by aerial photo interpretation. The south-facing slopes are predominately covered in chaparral, grassland, and oak savanna, whereas the north-facing slopes tend to foster oak woodlands.

The California Natural Diversity Database (CNDDB) has identified a number of species that reside in the Ventura Hillsides as special status species, the most charismatic being the Tricolored Blackbird (*Agelaius tricolor*). Over 99 percent of the Tricolored Blackbird population is within California. Surveys have indicated that the population is declining. In 1994, researchers estimated that there were 370,000 breeding adults in California. This number dropped to approximately 233,000 in 1997. This decline is thought to be a result of habitat loss. The Tricolored Blackbird prefers emergent wetland vegetation for feeding, cover, and reproduction. The hillsides provide this important habitat for the Tricolored Blackbird with approximately 40 acres of wetlands. The Tricolored Blackbird is on the United States Fish and Wildlife Service (USFWS) informal list of Species of Concern and is listed by the California Department of Fish and Game (CDFG) as a Bird Species of Special Concern (CDFG, California Wildlife Habitat Relationships System: Tricolored Blackbird, 2004 ; National Audubon Society, 2002).

Other species of concern identified in the CNDDB include the Monarch Butterfly (*Danaus plexippus*), Southern Tarplant (*Centromadia parryi ssp. australis*), Ventura Marsh Milk-Vetch (*Astragalus pycnostachyus var lanosissimus*), and Aphanisma (*Aphanisma blitoides*). Additionally, the hillsides contain southern coast live oak riparian forest as identified in the CNDDB.

2.3. Recreational Resources

The hillsides serve as a gateway to a wide variety of recreational opportunities and natural experiences. This is because of their undeveloped coastal environment, complex and scenic biophysical features, social and cultural importance, and close proximity to Ventura County residents.

The Ventura hillsides represent the only remaining undeveloped land of its size in Ventura County that provides continuous views of the California coast, the Pacific Ocean, and the Channel Islands. With trails leading into the coastal foothills, the hillsides would grant access to unique recreational opportunities against the picturesque backdrop of the coastal environment.

The hillsides provide a great opportunity for a number of recreational uses with the diversity of scenic features, the varying topography, and the assortment of habitats and wildlife species. Additionally, the variety of habitats within the hillsides serves as a significant resource for interpretive education purposes.

The hillsides also serve as an important social and cultural location. While the hillsides are currently not accessible to the public, trespassing does occur within the area especially to the "Two Trees," which is a signature landmark for Ventura residents. The experience of walking in or near the hillsides has become a tradition that many generations in Ventura have enjoyed.

From Carpinteria to Malibu, there are no publicly accessible hiking trails that lead into the coastal foothills. Due to the hillsides' close proximity to surrounding cities and neighborhoods, this area would provide the nearest trails for the residents of Ventura and Oxnard.

2.4. Visual Resources

The Ventura hillsides are one of the most visually pleasing features in the Ventura area. They provide a range of features to view from within the city including ridgelines, canyons, peaks, the "Two Trees", and an array of vegetation types (Figure 2). These visual resources add to the natural character of the City of Ventura, and hence are a conservation priority for the Ventura Hillsides Conservancy.

Figure 2. A photo of the "Two Trees" taken from Foothill Road.

3. Methods

3.1. Acquisition Strategy Development

Given the variety of resources in the Ventura hillsides, it is understandable why the VHC wishes to preserve the area for the benefit of current and future generations. However, the VHC is faced with the difficult task of deciding which parcels to acquire within the area. The VHC's current acquisition strategy provides broad goals and objectives to guide acquisition decisions. One of our main goals in this project was to design a comprehensive approach for making effective acquisition decisions that expands upon the VHC's current acquisition strategy. We felt that while the VHC's current acquisition strategy provides general guidelines for making acquisition decisions, the VHC would benefit by having additional tools to call upon when parcels become available.

3.1.1. VHC's Acquisition Strategy

The VHC's acquisition strategy includes a list of eligibility standards that reflect the VHC's objectives in acquiring parcels (Appendix 7.1). These objectives involve the protection of three types of resources:

1) Biological Resources (native plants, wildlife, and habitat)
2) Recreational Resources (public access and trail connections)
3) Scenic Resources (ridgelines and viewsheds)

In addition, the current acquisition strategy presents a list of selection criteria that provide more detailed information about these three types of resources, and account for other factors, such as the threat of development and the unique opportunity for purchase. Based on the mission and objectives in the acquisition strategy, we aimed to provide a set of tools that would assist the VHC in making informed acquisition decisions that would achieve their mission and objectives.

3.1.2. A Comprehensive Acquisition Framework

The process of acquiring parcels is a dynamic one that cannot simply be achieved by trying to acquire the best sites based solely on resource value. Social, political, and economic issues, threat of development, and opportunity are all factors that must be considered when formulating an acquisition strategy. Therefore, we envisioned that the most effective solution to this problem would be to provide multiple tools for the VHC.

Criteria Scoring System

First, we developed a Criteria Scoring System that quantifies the resource value of sites under the three categories of eligibility standards described in the VHC's Acquisition Strategy Document: 1) Native Plant or Wildlife Value, Native Habitat Value, and Restoration Potential; 2) Public Access and Recreation; and 3) Scenic Resources, such as ridgelines, and viewsheds. We simplified the titles of the three Rubrics: Public Access and Recreation; Native Plant, Wildlife, and Habitat; and Visual Resources.

To complete the site evaluation, we used a scoring procedure similar to the one developed by NatureServe (The Nature Conservancy, 2000). Their four-level scoring system involves classifying sites as "Very Good", "Good", "Fair", and "Poor". Numerical scores can be associated with each class, which may then be added, multiplied, or averaged (e.g. "Very Good"=4.0, "Good"=3.5, "Fair"=2.5, "Poor"=1.0). We used a similar four-level scoring system with whole number values from 4 to 1, which represent high to low resource quality.

To assign scores to the land, we evaluated it against multiple criteria for each of the three Rubrics. Many conservation initiatives use scoring systems that involve multiple criteria to produce a ranking that shows which sites have the greatest conservation importance as determined by their resource value. Some successful examples, which led us to choose this method of scoring, are The Conception Coast Project's steelhead assessment (Stoecker and Conception Coast Project, 2002) and the Santa Monica Mountains Conservancy (Santa Monica Mountains Conservancy, 2000).

The criteria were determined by conducting research through a literature review and interviews with local experts, including local park managers and planners. Acres of land

within the Priority Acquisition Area were assigned a score of 1 through 4 for each criterion, based on resource attributes. Next, scores for all criteria were averaged to produce a final score for each of the three Rubrics. Figure 3 illustrates the scoring methodology used to assign scores for each of the criteria.

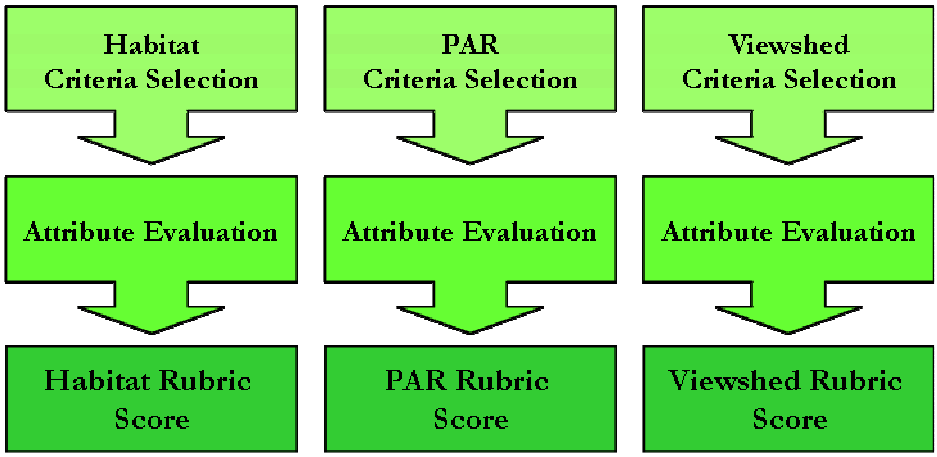


Figure 3. Conceptual model for criteria evaluation.

When obtaining the final score, the selection criteria and the Rubrics can be assigned different weights. The weights correspond to their importance in determining the total resource value of a specific site within the hillsides. For example, in assessing habitat value, the presence of wetlands might be considered a more important criterion than the occurrence of a sensitive species and could be assigned a higher weight. Adding different weights across Rubrics or choosing to place more importance on one Rubric might be based upon the subjective opinions of interested groups. For example, if a stakeholder values one Rubric over the others, more weight can be placed on that Rubric. With added weight, the highest scoring sites would include a greater proportion of the desired resource (e.g. more biological resources over recreational or visual resources).

Portfolio Analysis and Checklist

While numerical scoring systems are useful for providing a more objective method for evaluating resource values, they also have limitations. One main limitation is that "big picture" values can be missed when focusing on individual site assessments. For example, important resource values such as habitat connectivity might be neglected (Williams et al., 2004, and Davis, 2004). Also, social and/or political considerations that are integral components of making acquisition decisions may be overlooked (Santa Monica Mountains Conservancy, 2000).

Therefore, given the limitations of numerical scoring systems, we felt it necessary to provide the VHC with additional tools for making acquisition decisions. The Portfolio Analysis and Checklist are more qualitative in nature and take into account other factors that could not be included in the scoring system.

Portfolio Analysis

Given that the Criteria Scoring System ignores connectivity among parcels, we performed a Portfolio Analysis that considers the benefits of acquiring a parcel adjacent to an acquired parcel. For example, while a parcel by itself may not have any biological value, it may serve as an important connector between two parcels that have significant biological value. If a parcel of low resource value becomes available, the VHC can justify acquiring this parcel if it serves an important role within a future portfolio. Our rationale for performing the Portfolio Analysis was to view the value of sites from a system perspective, since viewing individual sites might not provide a complete picture of the cumulative resource value of groups of sites.

Checklist

Our final tool to make acquisition decisions is the Parcel Checklist. The Land Trust for Santa Barbara County is an example of a conservation organization that uses checklists to decide which properties to acquire (Land Trust for Santa Barbara County, 2003). The Land Trust has three checklists that it reviews when a property becomes available: 1) Goals and Purposes Checklist, 2) Public Benefit Checklist, and 3) Feasibility Checklist. Each checklist contains multiple criteria that will determine whether a property qualifies for selection.

We created three similar checklists: 1) Minimum Qualifications Checklist, 2) Public Benefit Checklist, and 3) Infeasibility Checklist (see Appendix 7.6 for the complete checklists). These checklists parallel the same objectives as described for the Land Trust's checklists, including determining whether a site meets a minimum threshold to be considered for acquisition, ensuring that sites provide benefits to the public, and making certain that sites do not have any undesirable qualities that would preclude them from consideration.

Our main purpose for the checklists was to account for information that could not be determined through the scoring method. Therefore, the VHC can use the checklists to conduct further investigations of an individual site once it becomes available for acquisition. For instance, even if a property scores high in our Criteria Scoring System, the VHC may decide not to pursue it due of lack of public support, overall complexity, timing, or other practical considerations. If a parcel falls short of the minimum criteria established in the Parcel Checklist, then it should be declined due to the discord between the parcel's merits and the VHC's long-term goals. In addition, the Parcel Checklist includes other considerations or unknown variables that need to be considered based upon the timing of the acquisition or additional coinciding events. The VHC may place more weight on the acquisition of its first parcel as a way to gain credibility with the community or to build momentum. Furthermore, the Parcel Checklist can be used as a safeguard when evaluating a potential parcel to ensure that the property is free from hazards and liabilities and that the purchase price is acceptable given its appraised value.

Acquisition Framework

The Criteria Scoring System, Portfolio Analysis, and Checklist together form a comprehensive framework for making acquisition decisions to employ when a parcel becomes available. A conceptual model of this approach is illustrated below.

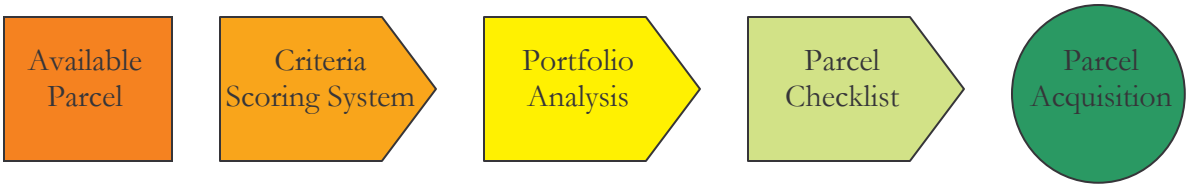


Figure 4. Conceptual model of land acquisition approach.

The Criteria Scoring System involved significant technical and scientific expertise, and therefore served as the main portion of this project. Our primary goal was to assess the biological, cultural, and scenic resources in the hillsides and to identify sites in the hillsides that are rich in these resources. A resource assessment of parcels will allow the VHC to make informed acquisition decisions when parcels became available.

The VHC should consider resource value and political or economic feasibility in making the most effective and efficient acquisition decisions. Although parcel classification will provide baseline information for decision-making, the VHC should by no means feel bound to pursue parcels based solely on resource value. Furthermore, the acquisition of high resource parcels may not be possible due to political or economic obstacles. Therefore, as each parcel becomes available, we recommend that the VHC incorporate our Portfolio Analysis and Parcel Checklist to provide the necessary qualitative information in making an informed decision.

3.2. Evaluation Criteria

The criteria for evaluating sites within the hillsides are presented for the three Rubrics: 1) Native Plant, Wildlife, and Habitat, 2) Public Access and Recreation, and 3) Visual Resources. The development of the selection criteria involved consultation with the VHC and experts in biological, recreational, and visual resources. We understood the importance of ensuring that our classification system was based on the VHC's mission and objectives since the attributes that determine the value of a resource can be subjective.

3.2.1. Native Plant, Wildlife, and Habitat

A major goal for the VHC is the protection of sensitive habitats and species in the hillsides. To ensure the VHC acquires land that will protect the highest quality and most sensitive habitats, we developed a list of criteria for assessing the biological resources of the area. The following criteria are based on several sources: the VHC's criteria listed in their Acquisition Strategy, research on other land conservancies' strategies, and consultation with biologists. The VHC's acquisition objectives concerning native plant, wildlife, and habitat value are listed below.

1. The acquisition provides suitable habitat for or supports local-, state- or federally-listed rare, threatened or endangered plant or animal species.
2. The acquisition provides local-, state- or federally-recognized sensitive habitat types, or opportunity for restoration or enhancement of such habitat types.
3. The property provides important water quality or other watershed benefits or protection.
4. The acquisition contains a perennial, intermittent, or ephemeral drainage, wetland, or other water body.

We researched the criteria used by other organizations, such as Herts and Middlesex Wildlife Trust (1998) in the United Kingdom and the Waltham Land Trust (2004) of Massachusetts to evaluate habitat quality. We then developed similar criteria, which would meet the VHC's objectives, allowing us to complete an assessment of habitat and species sensitivity, and habitat quality in the hillsides. We created a vegetation map and divided the land into polygons based on vegetation series (Section 3.5.1). These habitat polygons were evaluated for the eight criteria discussed below and summarized in Table 1.

1. Local Rarity of Habitat Type

Because all of the vegetation series in the Ventura hillsides are "considered rare and worthy of consideration by the CNDDB" according to the CDFG (Wildlife and Habitat Data Analysis Branch, 2003), we determined that the best way to classify the habitat types would be according to their rarity in the Ventura hillsides. We assumed that the proportions of habitat types in the hillsides are similar to the proportions of these same habitat types throughout Southern California. Coast live oak woodlands and savannas as well as wetland vegetation such as mulefat and sumac are least represented in the hillsides and therefore received a higher score. The more common vegetation series, such as California annual grasslands and purple sage scrub, received a lower score.

2. Presence of Wetlands

Wetlands are sensitive habitat types that support a diversity of species and provide a variety of biological functions, and therefore deserve special attention when choosing land for conservation. Wetlands are also quickly disappearing throughout Southern California as development increases. Further, because wetlands in Southern California are very different from the traditional classification of wetlands in the eastern U.S., local wetland have not been readily preserved (Ferren et. al., 1995). Therefore, we decided to include a separate criterion to represent the significance of wetlands.

Wetlands can be natural or man-altered. Man-altered wetlands are those classified as diked or excavated, according to the National Wetlands Inventory (NWI) (U.S. Fish and Wildlife Service, 2004). To evaluate the habitat polygons for wetlands, we gave those habitats containing natural wetlands the highest score of 4, those containing man-altered wetlands a score of 2, and those areas with no wetlands received a score of 1.

3. California Natural Diversity Database Occurrence of Sensitive Species

To ensure the protection of sensitive species in the hillsides, we needed to know which species listed as sensitive were present on the properties. Since we were unable to access the properties, we used the CNDDB to find sensitive species known to inhabit the hillsides. The CNDDB provides observed point occurrences of sensitive species, as well as ranges of potential habitat around the points. (CDFG, Natural Diversity Database, 2003). If a habitat polygon contained a point occurrence, it received a score of 4. If no point occurrences of sensitive species were observed within a polygon, it was given a 1.

4. Suitable Habitat for Sensitive Species

Since the CNDDB only contains records of observed species, and given that the properties are not open to public access, we needed another way to assess the land for sensitive species that have not yet been observed, but are expected to occur in a given habitat. To evaluate habitat for expected occurrence of sensitive species, we used the Wildlife Habitat Relationship (WHR) database for California to obtain lists of California Threatened and Endangered species for each vegetation series within Ventura County. The WHR takes habitat criteria selected by the user and outputs a list of sensitive species expected to occur in those defined habitats. We matched the vegetation series from our map with the habitat types classified by the WHR, according to "CWHR Wildlife Habitats Crosswalked with CNPS Vegetation Series" (CDFG, 1998). We queried the WHR for sensitive species listed by the California State Government that could be expected within habitat types that corresponded to the vegetation series found in the hillsides and within Ventura County. The series that were expected to support more sensitive species received a higher score, and those that supported a lower number of sensitive species received a lower score (Table 1).

5. Local Threat of Development

Another important factor related to the sensitivity of a habitat type or suitable habitat for a sensitive species is its threat of development. The threat of development was evaluated per parcel rather than habitat polygon. We assumed that if development would occur in the hillsides, it would likely spread from current development. So, those parcels nearest to developed areas were determined to have the greatest threat of development. Each parcel was given one of four scores: a) 4 for high threat, meaning the parcel was located within the city boundary, b) 3 for medium threat if the parcel was adjacent to development, c) 2 for low threat if the parcel was not adjacent to development or had some protection through the Williamson Act[1], or d) 1 for no threat if the parcel was already protected by a conservation easement. As far as we know, there are no parcels within the PAA that have conservation easements. However, a score of 1 could be given to parcels with conservation easements in the future.

6. Contiguity

We evaluated habitats for contiguity, which reflects the degree of habitat quality or its ability to support wildlife. Contiguous habitats are those that are large and undisturbed by fragmentation. Fragmentation by roads and other disturbances create smaller, less

[1] Williamson Act of 1965 – State Land Conservation Act in which farmers can pledge to maintain their property as farmland for a period of ten years and in return receive a property tax break.

connected habitat patches. Our goal to protect a diversity of species rather than just a single umbrella or key species made it difficult to design a single criterion for contiguity, because the effects of fragmentation are species-specific (Theobald and Hobbs, 2002). We chose to use the size of patch and degree of fragmentation within the patch to score habitats for contiguity. First, we divided the habitats within a vegetation series into small area habitats and large area habitats. Some vegetation series are smaller in area by nature, so rather than classifying habitats as small or large in general, we chose to classify specific habitat types as small or large for the specific vegetation series that occurs there. For example, we ordered all of the grassland habitats according to area, greatest area to least area. Then we divided the grassland habitats in half, so that the first half was considered to be large area habitats and the second half was designated small area habitats. Then, we assessed each habitat polygon for contiguity of natural habitat cover. If a polygon was divided by a road, then it was considered to be fragmented. Finally, the polygons were scored according to the following scheme: a) 4 for large habitat areas that were contiguous, b) 3 for small habitat areas that were contiguous and for large habitat areas that were fragmented, c) 2 for small habitat areas that were also fragmented, and d) 1 for developed areas that were obviously very fragmented and therefore were not considered high quality habitats for wildlife.

7. Human Disturbance

Destruction of habitat for the development of roads or resource extraction affects the quality of habitat and its ability to support wildlife. Less human disturbance equals higher quality habitat for wildlife. We evaluated the habitat polygons for extent of human disturbance, and those polygons with a greater extent of human disturbance received a lower score. Areas where vegetation cover was removed (as seen in aerial photography) were defined as human disturbed areas. This type of disturbance includes roadways, oil drilling facilities, and oil sumps. Polygons with no disturbance received a 4, those with up to ten percent of cover removed received a 3, those with between eleven and twenty-five percent extent of disturbance received a 2, and finally, those polygons with greater than twenty-five percent disturbance received a score of 1.

8. Restoration Potential

National Geographic defines restoration as "the repair of ecological damage to an ecosystem so that it is close to the natural condition prior to a disturbance and it can function as a normal self-regulating system. This is done through processes such as chemical cleanups, revegetation, and the reintroduction of native species" (National Geographic, 2001). Since restoration can be expensive, VHC prefers to acquire parcels that have minimal restoration expense.

The restoration potential criterion evaluates the habitat polygons for approximate costs of restoration. For instance, if areas have been grazed by cattle, restoration will be less costly than the removal and cleanup of an oil derrick. The habitats where restoration is recommended were scored according to cost, which was estimated by the type of restoration needed. Members of the VHC, who have professional knowledge of restoration and its costs, provided information on types of restoration and costs. Those habitat polygons with no need for restoration received a score of 4, while habitat patches with more costly restoration received a lower score. Low cost of restoration, less than $50,000 includes restoring land that has been lightly grazed, and these habitats received a score of 3. Those

habitats that were heavily grazed as well as graded for roads or turnarounds would require a greater effort of restoration and a moderate cost between $50,000 and $125,000. We ignored those roads that were necessary to access utilities such as power lines and storage tanks when assessing for restoration potential. These habitats were given a score of 2 for moderate cost of restoration. Finally, the habitats that were disturbed by oil exploration are likely to be contaminated, and therefore would be over $125,000 to restore. The habitats disturbed for oil exploration were given a score of 1.

9. Wildlife Movement Corridors

A wildlife movement corridor is a path of wildlife habitat, generally native vegetation, which joins two or more larger areas of similar wildlife habitat (Cavallaro et. al., 2005). They function to protect and sustain wildlife. These corridors typically occur along streams and drainages and facilitate the movement of wildlife because food, water, and protection by vegetation cover are more readily available in these areas. Development in the paths of these corridors hinders the movement of wildlife; therefore, critical habitats should be considered when choosing land for conservation. Currently, there is not a sufficient amount of data available to determine the locations of these corridors, but we recommend that when the VHC obtains further information, they include corridors in their criteria for choosing land. If a wildlife corridor is present, a parcel would receive a score of 4, while parcels with no wildlife corridors would receive a 1.

Table 1. Criteria scores for habitat, wildlife, and restoration potential.

Habitat, Wildlife, and Restoration Potential Criteria				
Criterion	**4**	**3**	**2**	**1**
Habitat Sensitivity and Species Sensitivity				
Local rarity of habitat type – Least to most represented in the hillsides	Coast live oak, woodland and savanna	Mulefat, sumac, coyote brush	California annual grassland	Purple sagebrush, California sagebrush
Presence of wetlands	Natural wetland	N/A	Man-altered wetland	No wetland
CNDDB occurrence of sensitive species – Does the vegetation polygon have a CNDDB sensitive species occurrence?	Point occurrence	--	Within range of point occurrence	No occurrence
Suitable habitat for sensitive species - The number of sensitive species the habitat type supports	A high number - California annual grassland	Moderate number - sumac and mulefat	Low number - coast live oak woodland and savanna, California sagebrush, purple sagebrush, coyote brush, and Impossible to Differentiate	None - Developed
Local Threat of Development				
Development Threat	High, within city boundary	Medium, adjacent to development	Low, not adjacent to development, or protection by Williamson Act	None, already protected by easement
Habitat Quality				
Contiguity	Large and contiguous	Small and contiguous, and Large and fragmented	Small and fragmented	Developed
Human disturbance	0% disturbance	Up to 10% disturbance	11 to 25% disturbance	Greater than 25% disturbance
Restoration- The amount of restoration recommended	No restoration	Low cost restoration (<$50,000)	Moderate cost restoration ($50,000 – $125,000)	High cost restoration (>$125,000)
Presence of wildlife movement corridors – Does a wildlife corridor pass through the property?	Yes	--	--	No

3.2.2. Public Access and Recreation

The Ventura hillsides offer a variety of public access and recreation opportunities. Many points along the hillsides are accessible from nearby neighborhoods and lead to roads or trails that have the potential to provide opportunities for hiking, wildlife viewing, biking, and horseback riding. In addition, some roads and trails lead to vista points that overlook unique scenic features, such as the Channel Islands or Topa Topa Mountains, or that lead to culturally significant sites, such as the well-known "Two Trees" that serve as a signature landmark for Ventura residents.

One of the VHC's goals for acquiring parcels is to ensure that the public has access to the hillsides and can enjoy the scenic and recreational qualities of the area. The VHC lists four objectives that relate to this Rubric:

1. The acquisition provides or potentially may provide public access for passive recreation.
2. The acquisition presents the opportunity for significant passive recreation opportunities or has high interpretive education value.
3. The acquisition includes or potentially includes an important trailhead, a regional or local trail or trail connection.
4. The acquisition provides a vista point for a significant scenic feature such as the Channel Islands or Topa Topa Mountains.

In determining the methods for parcel scoring, we focused our attention on these four objectives since they are of importance to the VHC and coincide with how other conservancies and public agencies determine public access and recreation value.

In addition, we decided to evaluate roads or trails that already exist within the hillsides. In many circumstances, the use of existing roads and trails for recreational opportunities provides a more cost effective way of providing recreational resources rather than constructing new trails. The Ventura County Parks Office uses this approach and selects abandoned roads, railroads, and old trails to provide for public access and recreation (Pam Gallo, personal communication, October 2004). Existing roads and trails in the hillsides may require minimal enhancement and maintenance and may often lead to a destination of historical or cultural significance, depending on their previous use. Therefore, our criteria would lead to a score for each trail within the hillsides.

To determine how to evaluate recreation opportunities in the hillsides, we first identified the specific activities that fall within the passive recreation category. Through consultation with the VHC, we identified four types of recreation opportunities for the hillsides: 1) hiking, 2) wildlife viewing, 3) biking, and 4) horseback riding.

Park Planning Guidelines, a professional document published by the National Recreation & Park Association, outlines trail attributes that provide for high quality recreational

experiences (Fogg, 2000). The trail design models presented in this document illustrate features that contribute to a high quality recreational experience (Appendix 7.7). Variability is an important attribute when designing trails, including variability in grade and vegetative cover. The destination of a trail is also another important factor. The six criteria to evaluate public access and recreation are summarized in Table 2.

1. Public Access for Passive Recreation

To assess public access for passive recreation, we determined whether or not trails began at roads that are adjacent to neighborhoods within the city of Ventura. Trails that begin at roads connected to Ventura neighborhoods would be directly linked to access points that are within walking distance from nearby residents or are accessible by car or bicycle.

According to other land conservancies, the proximity of trailheads to roads is an important consideration when evaluating public access opportunities. For example, the Ojai Valley Land Conservancy recently expanded public access opportunities at the Ventura River-Rancho El Nido Preserve by opening a second trail in early December 2004 (Ojai Valley Land Conservancy, 2004). The new trailhead, located at the end of Meyer road, is intended to improve public access to the preserve for hikers, mountain bikers, and horseback riders.

Furthermore, trails that begin at local parks serve as ideal locations for trailheads, since these trails can be complemented by facilities within the parks (Fogg, 2000). Therefore, we determined which trails begin at the two city-owned parks, Grant Park and Arroyo Verde Park, that connect to the Ventura hillsides.

Trails that met either of these sub-criteria, beginning at roads adjacent to city neighborhoods or connected to local parks, received the highest score of 4. Trails that did not meet either of these criteria received the lowest score of 1.

2. Habitat Diversity

Habitat diversity not only provides a more scenic experience when hiking, biking, or horseback riding, but it also increases the likelihood of viewing a larger variety of wildlife. The Santa Monica Mountains Conservancy recommends areas of habitat diversity to be ideal for passive recreation opportunities (Rorie Skei, personal communication, October 2004). These areas would most likely provide a variety of experiences that will cater to multiple interests. Since the aesthetic value of natural settings is subjective, a diversity of habitat types would provide different views for the public to enjoy while engaging in passive recreational activities. Furthermore, areas with diverse habitats support a wider variety of plant and wildlife species, which further enhance the quality of the recreational experience (Fogg, 2000).

To evaluate the habitat diversity criterion, we looked at the type and variety of habitat that each trail passed through. Trails that passed through mostly developed land received the lowest score of 1. For trails that passed through mostly undeveloped land, scores of 2, 3, or 4 were assigned depending on the number of vegetation or habitat types adjacent to the trail. Trails that passed through one habitat type received a score of 2, trails through two habitat types received a score of 3, and trails through three or more habitat types received a score of 4.

3. Grade Variability

Grade variability is an important trail feature for similar reasons as habitat diversity. Trails that have variation in grade will meet the recreational needs of a wider range of users. Steep trails will not be appropriate for elderly users, while flat trails will not be challenging enough for more physically fit users. Variation in grade allows both user groups to use the trail and provides an interesting recreational experience.

The maximum gradient for a trail should not exceed 10 percent (Fogg, 2000). Therefore, trails with a maximum grade higher than 10 percent received the lowest score of 1. In addition, trails with a maximum grade lower than 10 percent were scored based on whether they have low, moderate, or high variability, with a higher score given to trails with greater variability. Trails with grades that do not vary or that vary once, received a score of 2; trails with grades that vary twice received a score of 3; and trails with grades that vary three or more times received a score of 4.

4. Cultural Significance

Trails that lead to a final destination of cultural significance or provide access to a culturally significant site should receive a high score. Cultural significance does not include areas with archaeological resources because we were not able to find information on their locations. In addition, after consulting with the VHC, we decided that archaeological artifacts are not desirable due to the risk that these areas would be disturbed. Therefore, we determined that the main area of cultural significance within the hillsides is the "Two Trees".

The "Two Trees" are two big Blue Gum Eucalyptus trees on top of a ridge that is highly visible from the city of Ventura. Because of the cultural significance of the "Two Trees", trails that lead to this site received the highest score of 4. Trails that did not lead to this site received a score of 1.

5. Trail Connectivity

Connectivity is an important trail feature because it allows users more options for recreational experiences. While day hikers would prefer shorter trails, other recreational users such as bicyclists would prefer trails that have a minimum of three to five miles, with an ideal length of 10 to 30 miles (Fogg, 2000). The majority of trails in the hillsides do not reach the ideal length for bicyclists, but multiple trails that connect with each other have the potential to meet this ideal length.

To evaluate connectivity, we decided to assign a high score of 4 to trails that have at least one connection to another trail. Trails with absolutely no connection received a score of 1.

6. Scenic Features

Trails offering views of areas with aesthetic value should receive high merit since they afford a more enjoyable recreational experience. The VHC designates views of the Channel Islands and Topa Topa Mountains as examples of important scenic features that should give trails high values for recreation.

We were not able to determine which trails provide views of the Channel Islands or the Topa Topa Mountains, since these areas exist beyond the boundaries of the available dataset (Section 3.5). We considered choosing other scenic features and evaluating the trails that provided views of these other features; however, difficulties arose in deciding which scenic features to include since the quality of a viewshed is subjective.

Therefore, rather than choosing specific features, we decided to give high scores to trails that did not provide views of any undesirable scenic features. Trails that provided views of disturbed areas, such as oil derricks and other industrial operations, received the lowest score of 1. Alternatively, trails that did not provide views of these disturbed areas received the highest score of 4. This information would serve as a starting point for evaluating the viewshed from the hillsides. Trails that do not meet the minimum qualifications for aesthetic value (e.g. include views of oil derricks) could be eliminated, and a more in-depth analysis of viewshed could be conducted once the VHC gains access to the sites and could collect the necessary data for evaluating viewshed.

Table 2. Criteria scores for public access and recreation.

Public Access and Recreation Criteria				
Criterion	**4**	**3**	**2**	**1**
Public Access - Location of trailhead	At a road or a local park	--	--	Not at a road or a local park
Habitat Diversity - The number of habitats the trail passes through and their development state	Three or more habitat types, mostly undeveloped	Two habitat types, mostly undeveloped	One habitat type, mostly undeveloped	Mostly developed land
Grade Variability - The variability of grade and maximum grade	Grade varies three or more times, maximum grade of 10%	Grade varies two times, maximum grade of 10%	Grade varies one time or does not vary, maximum grade 10%	Maximum grade greater than 10%
Cultural Significance – The access the trail provides to culturally significant areas	Leads to a culturally significant site (e.g.. "Two Trees")	--	--	Does not lead to a culturally significant site
Trail Connectivity - The number of other trails that the trail connects to	At least one	--	--	No connection
Scenic Resources - Whether disturbed area can be seen from trail	Cannot see disturbed area	--	--	Can see disturbed area

3.2.3. Visual Resources

The modeling and analysis of visual resources is a common technique in land use change applications, and is just recently overcoming certain barriers that had been preventing its widespread use in planning for open space conservation (Geronimo et al., 2001). Additionally, the use of a GIS is a common practice to automate spatial data computations

(Tulloch, 2003), which can result in powerful analyses with basic publicly available data such as land cover and elevation.

The use of visual analysis in landscape architecture has a long heritage (Tandy, 1967, Amidon and Elsner, 1968, Lynch, 1976). There has even been a link from visual analysis and the cognitive interpretation of a viewshed to psychological and perceptual studies (Gibson, 1979, Benedik and Burnham, 1981). To justify its preservation of visual resources, the U.S. Forest Service (USFS) cites a human test subject study examining the calming properties of viewing a natural scene as compared to non-natural scene after being subjected to an environmental stressor (USDA, 1995). Visibility has even been modeled in an attempt to explain micro-scale variation in local property markets (Lake et al., 1998). These studies have attempted to illustrate the value of certain obvious, yet hard to define, qualities of visual resources.

A more practical approach for our application is the use of viewshed analysis in providing the best recreational amenity for hikers and others forest users (Lee and Stucky, 1998). Visibility is also important in preventing visual intrusion on the environment of endangered species (Camp et al., 1997). Camp et al. (1997) used viewshed analysis to create a buffer that more accurately reflects the intrusions that an endangered species is actually subjected to. Recent efforts have used GIS to model and define landscape preference for large-scale land use planning (Baldwin et al., 1996, Geronimo et al., 2001). Such information is useful when designing systems to classify a spatially explicit area according to its scenic attributes.

Though little has been done to model optimization techniques for visual resources, most, if not all, applications for small land conservation organizations have taken an opportunistic approach similar to their property acquisition strategies. The automation process used in a GIS for viewshed analysis has the potential to make the procedure more transparent and reduce some of the debate surrounding the selection of conservation properties (Lehamn, 1995). Due to these factors, we chose the procedure, objectives, and criteria described below to assess the visual resources of the Ventura hillsides.

We generated criteria to meet the objectives of the VHC's mission in preserving the natural qualities of the Ventura hillsides. The VHC's acquisition objectives concerning viewshed state that:

1. The property includes a unique scenic or natural feature.
2. The acquisition contributes to the protection of scenic views.

To be in agreement with the mission of the VHC, we assumed visual quality optimal in its natural condition. Therefore, areas affected by anthropogenic change would be, by definition, of lesser visual quality.

We developed three criteria that would allow us to complete an assessment of the Ventura hillside's viewshed. We applied the criteria to all viewable area in the VHC's priority acquisition area. These criteria are summarized in Table 3.

1. Level of Disturbance

Disturbance is a feature that can detract from the quality of a view while looking up from areas surrounding Ventura. The level of disturbance will effect how much viewshed quality is degraded or detracted from. We determined the level of disturbance based on the habitat condition; presence or absence of manmade structures, such as buildings, oil derricks, or water tanks; or other anthropogenic disturbances, such as orchards. The view received a score of 4 if no manmade structures are present, 3 if the view is mostly natural, 2 if the view is moderately disturbed and contained a single structure, and 1 if developed detracts from the view is present.

2. Presence of Distinguishing Landforms

Distinguishing landforms are important features that can add to the value of a viewshed. We evaluated the viewable area of the hillsides for distinguishing landforms such as named canyons, ridges, summits, or a cultural feature, such as the "Two Trees". These features were deemed significant if they were labeled on a United States Geological Survey (USGS) 1:24,000 topographic map of the area. These maps label socially important features either by name, or in the case of summits, by their peak elevation. This system allowed us to be objective in our selection of positive scenic attributes. The view received a score of 4 if at least three distinguishing landforms are present, a 3 if two distinguishing landforms are present, a 2 if one distinguishing landforms are present, and a 1 if no distinguishing landforms are present.

3. Contiguity of Other Viewshed Criterion

The contiguity of visual resources is an important feature for any viewshed. A contiguous landscape leads to a higher quality resource. We evaluated the contiguity of a viewable area based on the viewshed quality (level of disturbance and distinguishing features score) of neighboring viewable areas. We evaluated units of 25 acres for this criterion because a single acre pixel is not representative of the correct scale to evaluate viewshed. A unit's score ranged from 4 – 1 based on the conglomeration of the neighboring units' score. If the average of all neighbors' scores ranged from 4 – 3, the unit would score a 4 for contiguity.

Table 3. Criteria scores for viewshed.

Viewshed Criteria				
Criterion	**4**	**3**	**2**	**1**
Level of Disturbance	Natural - No manmade structures present, "natural habitat"	Mostly Natural – Some anthropogenic disturbance, natural habitat type may be difficult to distinguish	Moderately Disturbed - Altered by anthropogenic disturbance	Disturbed - Orchards, oil fields, or development present and detract from view
Presence of Distinguishing Landforms – How many of the following are present: named canyon, ridge, summit, two trees	Three are present	Two are present	At least one is present	None are present
Contiguity of other Viewshed Criterion – Score from contiguity score matrix	3-4	2-3	1-2	<1

3.3. Methods for Parcel Classification

To combine the scores for native habitat, public access and recreation, and visual resources, we chose an evaluation unit equal across all Rubrics. Planners in the United States measure the land in acres, so we chose to evaluate the land acre by acre. To do this, we used ArcGIS to convert our scored habitat polygons, buffered trails, and 25-acre viewshed units to one acre rasters (grid cells). The grids for each Rubric were then overlaid to view the scored resources for all three Rubrics together.

We used a simple additive weighting procedure to combine the three Rubrics. The weighted overlay function of ArcToolbox allowed us to weight all Rubrics equally, yet design a system that would allow the VHC to change the Rubric weights to meet their future demands (Figure 5). This characteristic makes our model robust for future use. We provided the VHC with an example and tutorial for the model separately from this report.

We normalized all Rubrics to the same 1-4 scale to assure equal comparison regardless of the number of Rubric criteria.

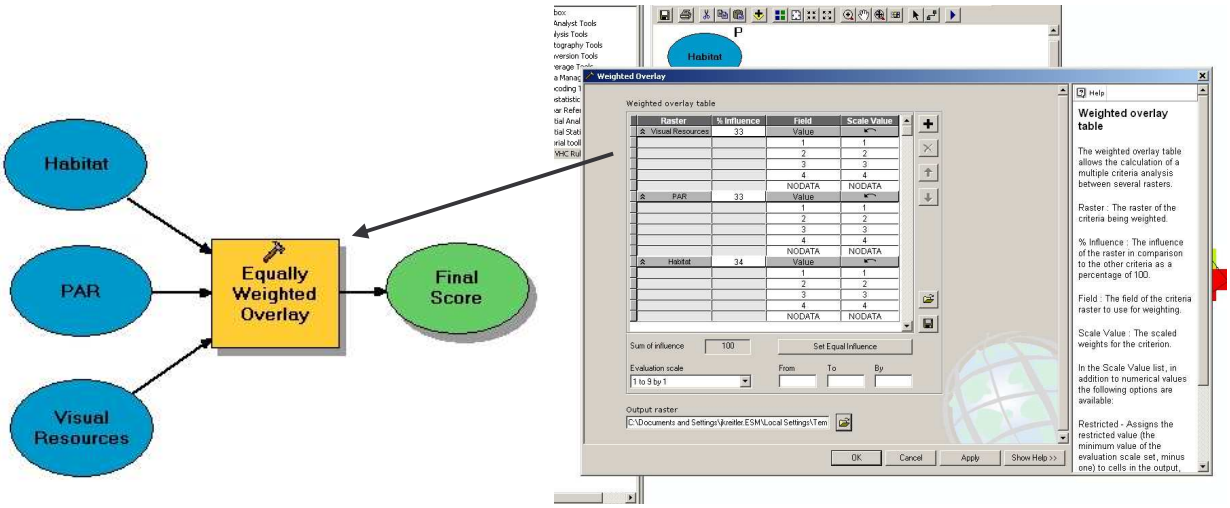


Figure 5. Adjustable Weighted Overlay Model used to combine the three Rubrics.

In order to distinguish parcels with the best resource values, we classified parcels into the top, middle, and bottom 33 percent. To score each parcel, we first calculated the area of the parcel that received a combined Rubric score of 1, 2, 3 or 4. Using these "score areas," parcels were assigned a score using the four scoring methods described below. Averaging the value of resources over large areas provide only a very general description of the resources present. By using four scoring methods, fewer details are lost in the process and more robust results can be provided. For the average and added weight methods, the parcel scores were then ranked highest to lowest and divided into thirds so that a parcel was assigned to the top, middle, or bottom rank based on how its total score ranked.

Average Score Method

The average score method is the arithmetic average of the calculated "score areas". This method equally weights all the scores within a parcel. The average score method can be described by the following equation:

$$\text{ParcelScore} = \frac{1\times(\text{"scorearea"1}) + 2\times(\text{"scorearea"2}) + 3\times(\text{"scorearea"3}) + 4\times(\text{"scorearea"4})}{\text{total parcel area}}$$

Added Weight Score Method

The added weight score method is a weighted average of the calculated "score areas". The average is weighted by squaring each score. This allows for extra weight to be placed on higher scores. A parcel is assigned the value of this weighted average. This added weight score method can be described by the following equation:

$$\text{ParcelScore} = \frac{1^2\times(\text{"scorearea"1}) + 2^2\times(\text{"scorearea"2}) + 3^2\times(\text{"scorearea"3}) + 4^2\times(\text{"scorearea"4})}{\text{total parcel area}}$$

Maximum Score Method

Using the maximum score method, a parcel is assigned the value of the maximum score within the parcel. This method places all the weight on the highest score within a parcel.

Minimum Score Method

Using the minimum score method, a parcel is assigned the value of the minimum score within the parcel. This method places all the weight on the lowest score within a parcel.

3.4. Data Sources and Analysis

3.4.1. Native Plant, Wildlife, and Habitat

In constructing the categorical vegetation map of the Ventura hillsides, we referred and incorporated data from several different sources. These sources include:

- On-site ground-truthing: Ground-truthing surveys were performed at three different locations around the hillside perimeter to verify the vegetation series were being correctly classified (Appendix 7.3).
- Aerial photographs: Aerial photographs taken in July 2002 served as the base line for map generation. The photographs were obtained from the City of Ventura, who originally acquired them from Air Photo USA. Each aerial file had a resolution of 1 ft. x 1 ft, with forty-eight frames comprising the hillside area.
- City of Ventura map products: A large component of data was generously provided to the VHC by the City of Ventura, such as data files for city roads, property and city boundaries, and many others.
- National Wetlands Inventory and California State University, Northridge Wetlands Map: A working copy of wetlands in the Ventura hillsides was acquired from the Ventura County Planning Division, who contracted California State University at Northridge (CSUN) to delineate county wetlands, according to the National Wetlands Inventory protocol. The NWI uses the Cowardin classification System, which includes five Systems of wetlands: Riverine, lacustrine, Palustrine, estuarine, and marine. The NWI has recently included a sixth System – riparian. These Systems are broken into sub-Systems, classes, and subclasses with modifiers describing the water regime and chemistry. The map used for this project was delineated from 2003 aerial photography taken by AirPhoto USA (U.S. Fish and Wildlife Service, 2004).
- Preliminary Descriptions of the Terrestrial Natural Communities of California (Holland, 1986) and California Native Plant Society's (CNPS), A Manual of California Vegetation: The descriptions of California communities by Holland were used to clarify the characteristic community of the area. We also consulted the CNPS, *A Manual of California Vegetation* (Sawyer, and Keeler-Wolf, 1995), to determine the plant species associated with the dominant community types. These informational sources were both

used to create the vegetation series classification scheme that allowed us to complete the vegetation map.

- California Natural Diversity Database of Natural Community Descriptions: Many unique populations of rare and threatened plants, animals, and natural communities exist in Ventura County. A large number of these natural communities are listed within the CNDDB, (CDFG, Natural Diversity Database, 2003) and have been described in Holland's *Preliminary Descriptions of the Terrestrial Natural Communities of California* (Holland, 1986).

During the initial assessment of the hillside aerial photographs, it became increasingly evident that delineating the map based on communities was too difficult because they could not be distinguished from each other. Therefore, since the majority of the community types were indistinguishable and there was limited access to the property, we decided to define the Habitat map at the series level.

Listed below are the series included in the Habitat map. There are eight vegetation series, a separate category for developed land and for areas that were impossible to differentiate, and a wetland group. We obtained the names and descriptions of each series from the CNPS' *A Manual of California Vegetation* (Sawyer and Keeler-Wolf, 1995).

In the Habitat map, we divided the coast live oak series into a woodland and savanna class. This was done because woodlands and savannas can function as separate and distinct habitats. In addition, it is important to note that the presence of non-native species could not be distinguished within the aerial photographs.

The following are the series used to make up the Habitat map. Additional information on how the Habitat map was created can be found in Appendix 7.2.

1. **Coast live oak series, woodland *(Quercus agrifolia)***
   Physical: Slopes often very steep; raised, stream banks and terraces. Soils mostly sandstone or shale-derived.
   Elevation: Sea level – 1200 m
   Species: *Coast live oak sole, dominant, or important tree in canopy*; bigleaf maple, blue oak, box elder, California bay, Engelmann oak, laurel sumac and/or madrone may be present.
   Structure: Trees < 30 m tall; canopy continuous, intermittent, or open. Shrubs occasional, or common.
   Ground layer absent.

2. **Coast live oak series, savanna, *(Quercus agrifolia)***
   Physical: Slopes often very steep; raised, stream banks and terraces. Soils mostly sandstone or shale-derived.
   Elevation: Sea level – 1200 m

Species: *Coast live oak sole, dominant, or important tree in canopy*; bigleaf maple, blue oak, box elder, California bay, Engelmann oak, laurel sumac and/or madrone may be present. In addition, bromes, California poppy, filarees, goldfields, lupines, mustards, oats, owl's clover, ryegrasses, and/or star thistles may be presents.

Structure: Trees < 30 m tall; canopy continuous, intermittent, or open. Shrubs occasional, or common.
Ground layer grassy.

3. **California sagebrush series *(Artemisia californica)***

Physical: Slopes steep, south-facing, rarely flooded low-gradient deposits along streams. Soils alluvial or colluvial-derived, shallow.

Elevation: Sea level – 1200 m

Species: *California sagebrush sole or dominant shrub*; black sage, brittlebush, bush monkeyflower, California encelia, chamise, chaparral yucca, coast goldenbush, coyote brush, deer weed, poison-oak, purple sage, and/or white sage may be present. Emergent lemonade berry or Mexican elderberry may be present.

Structure: Shrubs < 2 m; canopy continuous or intermittent.
Ground layer variable.

4. **Purple sagebrush series *(Salvia leucophylla)***

Physical: Slopes north facing, steep. Soils colluvial derived, may be rocky.

Elevation: 50-800 m

Species: *Purple sage sole, dominant, or important shrub with California sagebrush in canopy*; black sage, bush monkeyflower, California buckwheat, coast goldenbush, and/or white sage may be present. Emergent coast live oak, California walnut, laurel sumac, lemonade berry, or Mexican elderberry may be present.

Structure: Shrubs < 1.5 m; canopy continuous or intermittent.
Ground layer variable, may be grassy.

5. **Coyote brush series *(Baccharis pilularis)***

Physical: Stabilized dunes of coastal bars, river mouths, spits along coastline; coastal bluffs, open slopes, terraces.

Elevation: Sea level - 1000 m

Species: *Coyote brush sole or dominant shrub*; black sage, California blackberry, California buckwheat, California coffeeberry, California sagebrush, wax-myrtle, poison-oak, salal, white sage, and/or yellow bush lupine may be present.

Structure: Shrubs < 2 m; canopy continuous or intermittent.
Ground layer variable.

6. **California annual grassland series**

Physical: All topographic locations.

Elevation: Sea elevation to 1200 m elevation

Species: *Annual grasses and herbs dominant in ground layer*; bromes, California poppy, filarees, goldfields, lupines, mustards, oats, owl's clover, ryegrasses,

and/or star thistles may be presents. Emergent shrubs and tress may be present.

Structure: Grasses < 1 m series height.

7. **Sumac series**

Physical: Slopes often steep. Soils shallow, coarse.

Elevation: Near sea level – 400 m

Species: *Laurel sumac or lemonade berry sole, dominant, or important shrubs with black sage, hollyleaf redberry, or toyon in canopy*; bush monkeyflower, California encelia, California sagebrush, hollyleaf cherry, poison-oak, purple sage, sugar bush, and or yellow bush penstemon may be present. Emergent California walnut may occur.

Structure: Shrubs < 4 m; canopy open or continuous.
Ground layer sparse.

8. **Mulefat series *(Baccharis salicifolia)***

Physical: Habitats seasonally flooded, saturated. Water chemistry: fresh. Canyon bottoms; irrigation ditches, stream channels. Cowardin class: Palustrine shrub-scrub wetland.

Elevation: Sea level – 1250 m

Species: Mulefat sole or dominant shrub in canopy; arroyo willow, and/or narrowleaf willow may be present.

Structure: Shrubs < 4 m; canopy continuous.
Ground layer sparse.

Other series that maybe present on the hillsides but are undistinguishable from the aerial photographs are:

- Blue elderberry *(Samubcus mexicana),*
- Giant wild rye *(Elymus condensatus),* and
- Cactus *(Opuntia littoralis)* series.

9. **Developed**

A polygon was classified as developed if it contained evidence of human activities or anthropogenic changes to the natural environment. These include agricultural practices, buildings and parking lots, water and oil storage tanks, and radio antennas. This class also incorporated areas with evidence of oil exploration, pumping activities, and storing. Oil operations appear in the aerial photographs as oil derricks, vacant platforms, filled sumps, and intense road networks. Two polygons in this class are of an unknown origin because it was too difficult to conclude what type of activity had occurred.

10. **Impossible to Differentiate (ITD)**

There were certain areas in the hillsides where the vegetation series were difficult to classify. These ITD areas occurred in a few spots, but covered large extents. ITD areas also occurred in close proximity to the oil fields and Taylor Ranch. Additional on-site evaluation is necessary to classify these portions of the map.

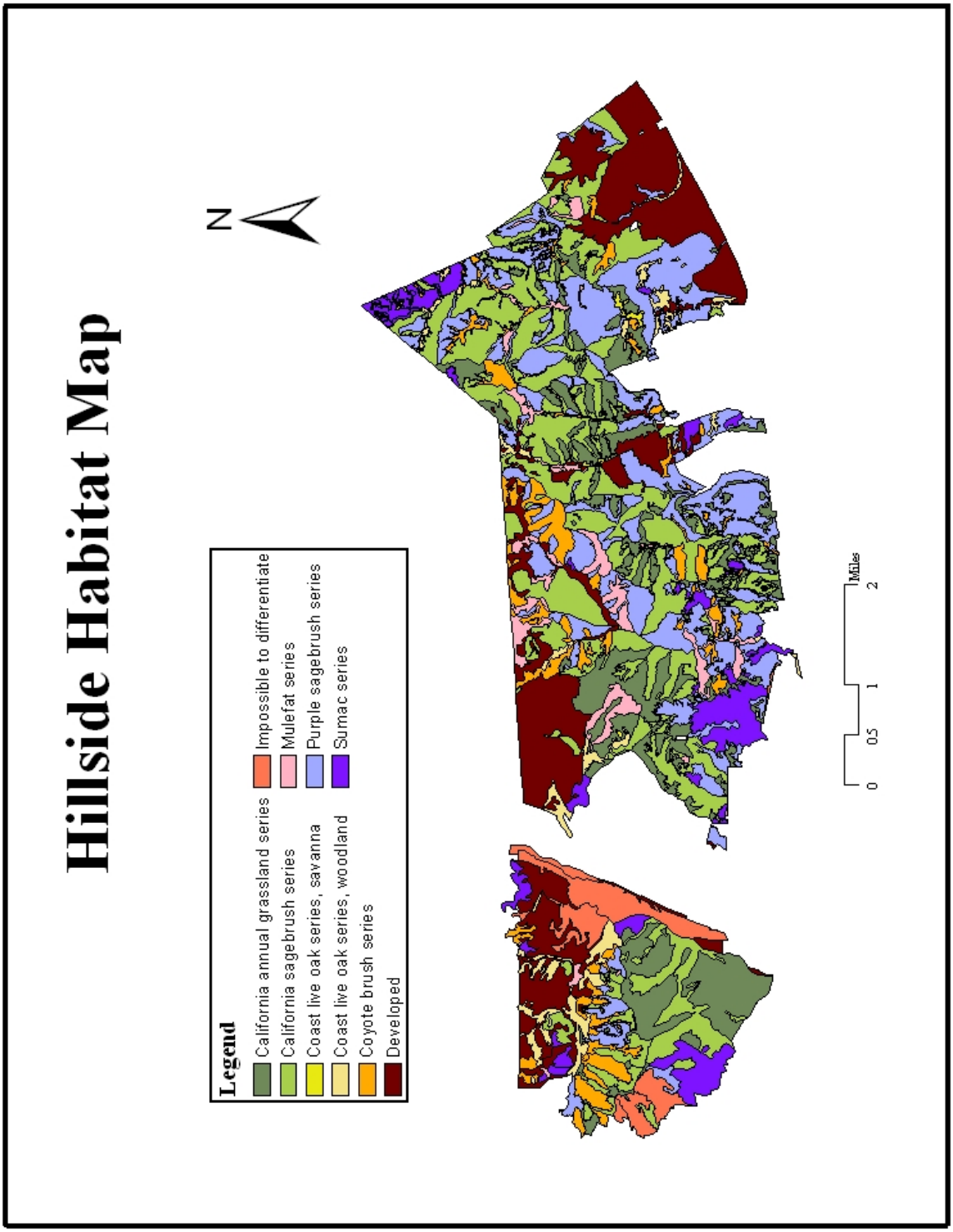


Figure 6. Habitat series classification map of the Ventura hillsides. The different colors represent the boundaries of distinct species that were distinguishable through aerial photographs.

Figure 7 illustrates the cumulative areas of the distinctive series types identified and mapped on the hillsides. The series that occupied the majority of the region is the California sagebrush series at 3,244 acres. A total of 2,555 acres are classified as purple sagebrush series followed by 2,373 acres classified as Developed. The forth-dominant series on the hillside is the California annual grassland at 1,999 acres. The coyote brush series and the sumac series both have a comparable presence to one another, with the latter having a combined total of 782 acres and the coyote brush of 815 acres. As do the summed polygons of Impossible to Differentiate with a sum of 527 acres and the mulefat series comprising 466 acres. The series that covered the least amount of area on the hillsides is the coast live oak series savanna and woodland. The areas of these two series add up to encompass the remaining 443 acres classified.

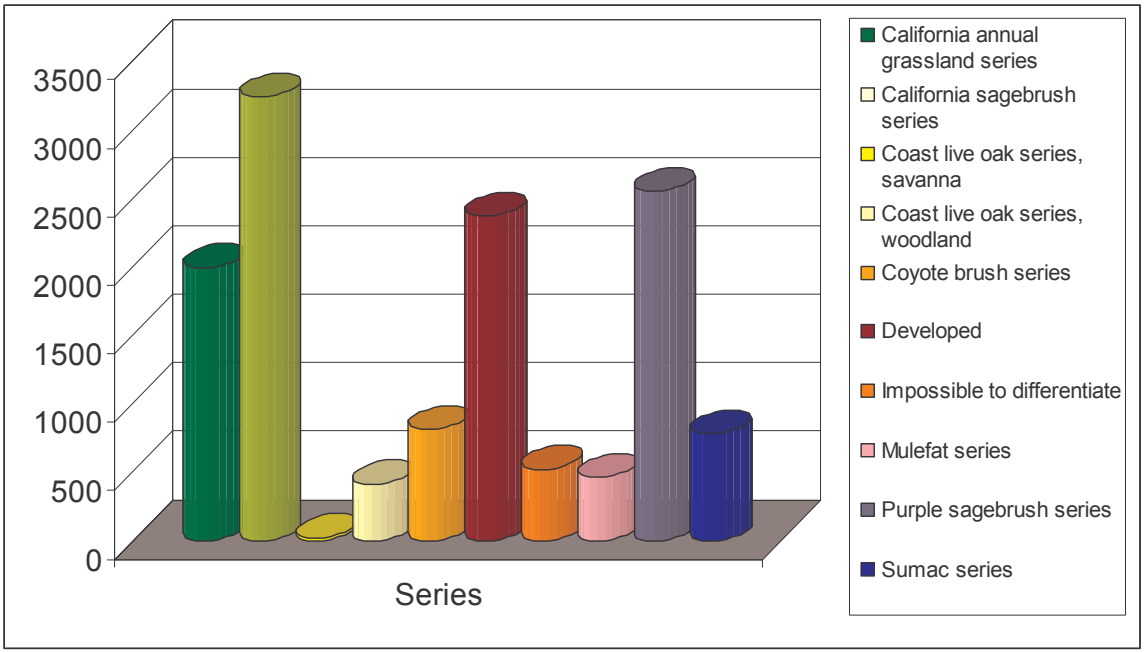


Figure 7. Total areas of the different series types for the hillside polygons.

3.4.2. Public Access and Recreation

To evaluate the hillsides for the Public Access and Recreation Rubric, we required four sets of data sources: the Open 80 Master Plan, the aerial photograph of the hillsides, the Digital Elevation Model (DEM), and the Habitat map.

Open 80 Master Plan

To evaluate existing trails, we acquired the public trails plan from the Open 80 Master Plan, a document created by developers providing designs for residential developments in two areas of the hillsides (Venturans for Open 80, 2002). The plan would set aside a portion of the hillsides as open space and would allow for public access and recreational opportunities. The public trails plan in the Open 80 plan was created using the existing road and trail

network in the hillsides. This map was our initial source of information for determining where trails or roads existed in the hillsides (Appendix 7.9).

Aerial Photography

We supplemented the data from the Open 80 Master Plan with information from the aerial photograph of the project site. After overlaying the potential trail map from the Open 80 plan onto our aerial photographs, we decided which trails from the Open 80 corresponded to existing trails and roads that were detectable in the photographs. With these two sources of information, we would have a higher probability of finding trails and roads that would be appropriate for public access and recreational purposes. We wanted to confirm that the potential trails map within the Open 80 Master Plan included trails that actually existed and would make sense for recreational uses.

A shapefile trail map was created that corresponds to both the Open 80 Master Plan and the aerial photograph. The trails were given a 20-foot buffer width. The trail map includes 135 trails within the VHC PAA. Fifty-five trails already had names assigned to them, since they are part of the existing road network. The remaining 80 trails were assigned numerical names. This analysis is available in Appendix 7.10.

Habitat Map

To evaluate our criterion for habitat diversity, we required information on vegetation types. We obtained this information from the Habitat map, as described in the previous section for the Native Plant, Wildlife, and Habitat Rubric (Section 3.4.1). Using the Habitat map, we examined the number of vegetation types that each trail passed through.

Digital Elevation Model (DEM)

The DEM was useful in determining the maximum slope of trails and assessing grade variability. At 1,000-foot intervals, the slope was recorded along each trail. With this information, we were able to determine the number of times that slope changed along a trail. In addition, we were able to separate out trails that had maximum slopes greater than 10 percent.

The DEM was also important in assessing the scenic resources of the trails. We viewed the aerial photograph and DEM in ArcGlobe, an application that shows a 3-dimensional view of the hillsides as they would appear when walking on a trail within the area. The use of ArcGlobe allowed us to zoom onto a trail in the hillsides and to determine whether disturbed areas, such as oil derricks, could be viewed from the trail.

Trail Attribute Table

After we acquired the necessary datasets, we scored the trails using our Public Access and Recreation criteria as described in Section 3.3.2. Scores for the criteria were placed in an attribute table within the trail shapefile as shown in Appendx 7.13. This will allow the VHC to determine which trails scored the highest for specific criteria.

3.4.3. Visual Resources

Minimal data are required to analyze the visual resources of an area. Our data needs include a three-dimensional data medium that represents the ground or canopy surface of analysis. Two common forms of representational elevation data include a raster (Figure 9) and a triangulated irregular network (TIN) (Figure 10). Both have their advantages and drawbacks. A TIN may take up less memory, though it is generally not as accurate. We used a TIN to generalize certain attributes (like ridgelines) that we found difficult to discern in a more detailed raster format. A raster will usually be more accurate (though it depends on cell size) and robust; more analysis techniques are available for that data medium as compared to a TIN. Furthermore, three-dimensional analyses are evolving away from the TIN and more techniques are being developed for the analysis of rasters.

We used a 10m DEM to model the visual resources of the Ventura hillsides. The selection of this data was thought to be the best compromise between necessary accuracy, precision, and computational power. A higher resolution DEM (3m resolution) was disqualified as a data source because the increased accuracy of the results were not needed, whereas a lower resolution DEM (30m resolution) did not produce accurate enough results or facilitate gains in data storage or computational speed to justify its use.

We created several primary data layers to facilitate the viewshed analysis. We needed to decide where the viewpoints would be located to view the hillsides. Furthermore, we identified the locations of positive and negative visual attributes on the hillside. We digitized these layers through the photo interpretation of high-resolution orthorectified aerial photographs and generalized positive features from a TIN and USGS topographic maps.

Analysis Technique

The viewshed analysis procedure is used to calculate which locations in a DEM can be connected by means of an uninterrupted straight line to a viewpoint location within any specified distance. Effectively, it calculates which locations or objects are not obstructed by topography and therefore may be visible from the specified viewpoint location (Llobera 2003). We performed this analysis in ESRI ArcGIS 9.0 with Spatial Analyst. Input data layers included a 10m DEM from USGS, and the following primary data we created: (i) user defined viewpoints of the Ventura hillsides from the city, (ii) areas of visual disturbance, (iii) areas of visual quality, and (iv) the contiguity score for each planning unit. A description of their creation technique is included in this chapter.

To evaluate the visual resources of the Ventura hillsides, we modeled the viewshed based on the quantity of view and the quality of view. The view quantity is simply an absolute measure of the visible area on and within the hillsides from the City of Ventura. This can be thought of as a binary system of "lights on" or "lights off" that pays no attention to differentiating visual properties among visible areas.

The quality of view is a more complicated measure that allows for the differentiation of visible areas. Areas are evaluated based on three criteria: (i) the area contains a positive

visual resource, (ii) the area contains a negative visual resource, and (iii) the area is visually contiguous with other areas.

Quantity of Visual Resources

We assessed quantity of view using the viewshed analysis function of ArcToolbox. Using ModelBuilder, we constructed a viewshed analysis model based on the USGS 10m DEM and 60 viewpoints on the main arterial streets and highways of Ventura. We used an additional parameter called an offset within the viewshed function to simulate the height at which the view was recorded. Points along the interstate had a 20 foot offset while points along arterial streets had an offset of 10 – 15 ft depending on their location. This parameter of the viewshed function allowed us to more accurately depict the viewshed when compared to the default value that models viewshed from the ground surface.

We found ModelBuilder to be an effective tool due to the limitations of the viewshed analysis function. The viewshed function limits viewpoints to 16 total points; however, 16 points did not give a satisfactory result. The use of ModelBuilder allowed us to input four separate viewpoint files that we aggregated to form the final viewshed analysis result. We used this result later as a mask to determine which planning units would be evaluated for visual quality. Figure 8 is a diagram of our viewshed model. Initial data sources are identified as blue circles which pass through analysis functions (yellow squares), that are combined to form the final result "Final Viewshed Result".

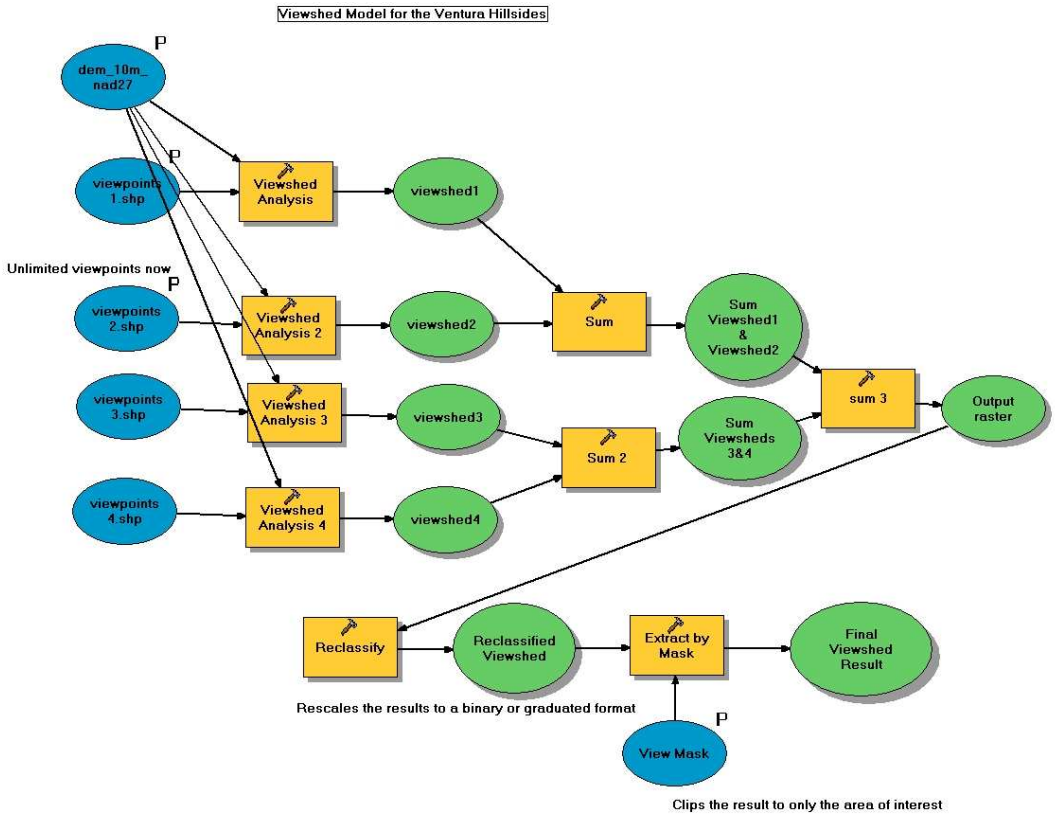


Figure 8. Diagram of the Viewshed Model used in ArcGIS.

Viewpoints used to assess the view quantity were placed along Highway 101, Highway 33, Highway 126, Thompson Avenue, and Telegraph Road (Figure 9). We chose these locations for two reasons. These roads and highways represent main arterials within Ventura and maximize the visual benefits to both highway users and residents of Ventura. In addition, we selected viewpoints at varying distances from the hillsides to ensure that the maximum amount of viewable area was analyzed for view quality to give a conservative estimate of viewshed.

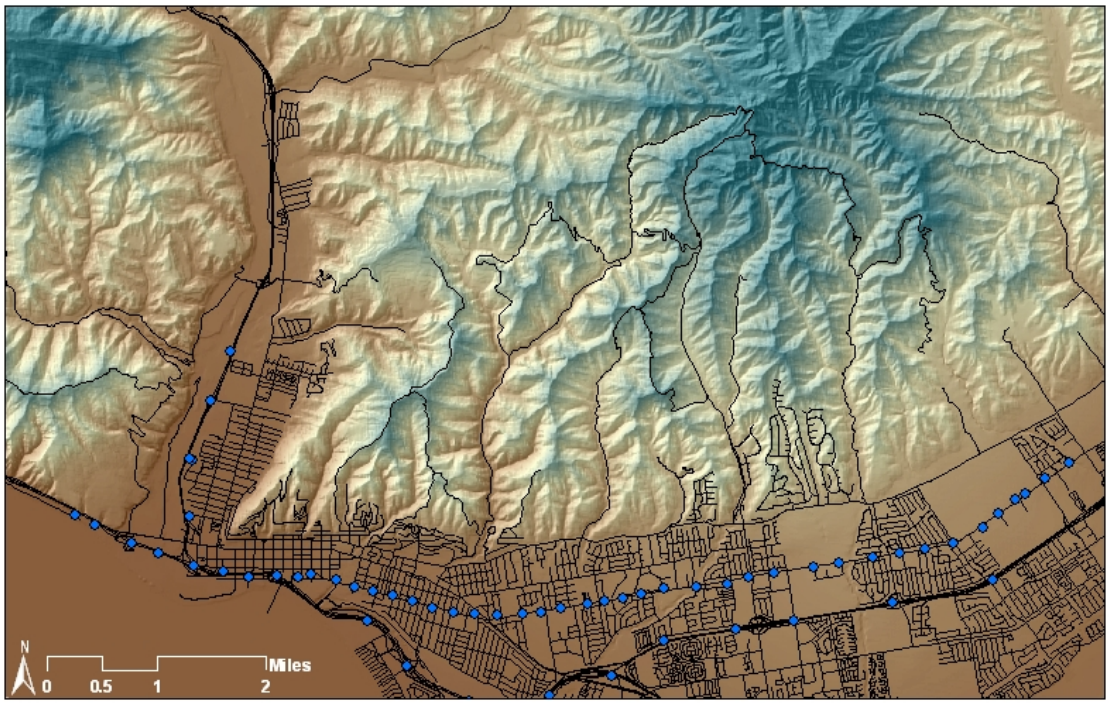


Figure 9. Viewpoints used in the Viewshed Analysis. The surface represents elevation ranging from high (green) to low (brown).

Quality of Visual Resources

Defining visual quality is a difficult task to accomplish quantitatively. Bishop et al. (2000) use image depth variables, such as depth or relief, as predictors of image quality. Likewise, Geronimo et al. (2001) described certain key viewshed properties related to visual preference including aerial extent, land cover, diversity, and edge. While these properties are significant in their described application, they were not easily transferred to our study. Due to the relatively small size of the PAA, we identified key types of features. These features included both positive and negative attributes that could add or detract from the visual quality of the area evaluated.

We decided the positive visual features located within the Ventura hillsides were summits, ridgelines, and canyons. The presence of these features visible from the viewpoints adds to

the visual resource of the hillsides. Summits and canyons were included if they were named on a USGS topographic map; we defined significant ridgelines somewhat subjectively based on a TIN produced from the 10m DEM. This process simplified the decisions because the TIN created generalized features that we easily identified.

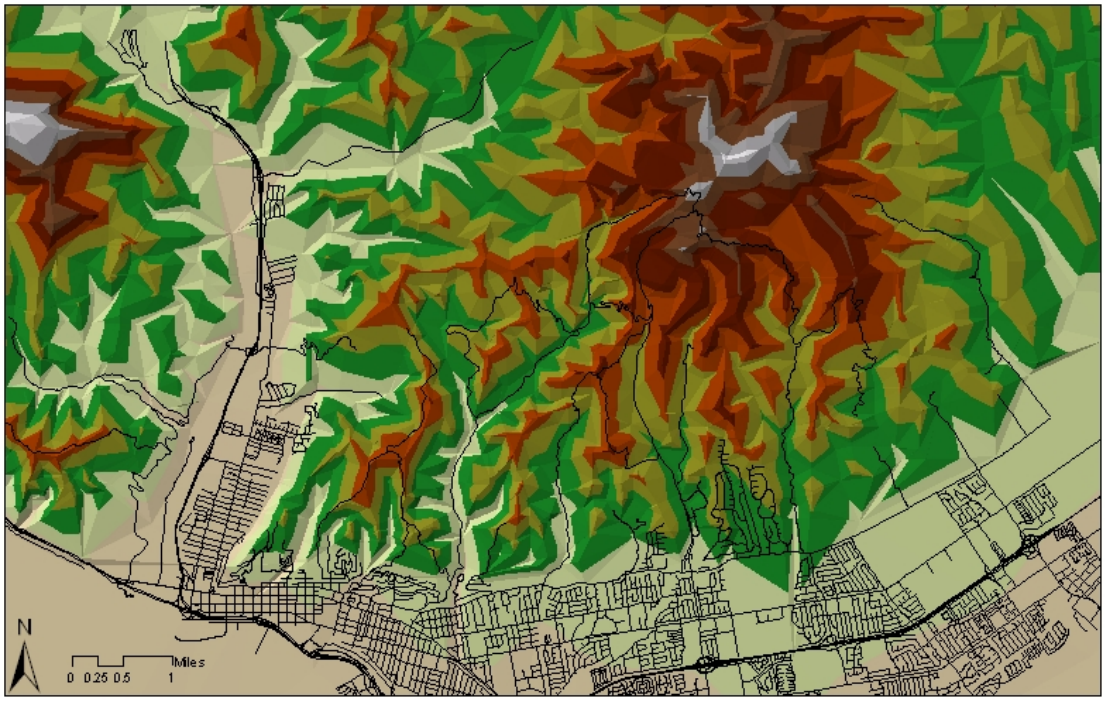


Figure 10. Triangulated Irregular Network (TIN) surface of the Ventura Hillsides used for generalizing ridges and canyons.

Similarly, certain negative attributes of the hillsides detract from the visual quality of the hillsides. To assess negative visual resources, we identified certain attributes that would detract from visual quality. These included any visible structure or anthropogenic disturbance that would alter the hillsides from their natural state. We identified these features during an onsite survey of the hillsides, using Highway 101, Thompson Avenue, and Telegraph Road as view corridors. From these corridors, we identified negative attributes such as towers, water tanks, and others structures on the high-resolution orthophotos. We then incorporated those points into an ArcMap data layer, with a 250 foot buffer, to create an area affected by the disturbance.

To analyze the contiguity of viewshed we aggregated the results of the previous step's viewable 1 acre pixels into larger 25 acre units. Contiguity is simply the aggregation of the individual pixels scores for both quantity and quality. This step is illustrated in Figure 11.

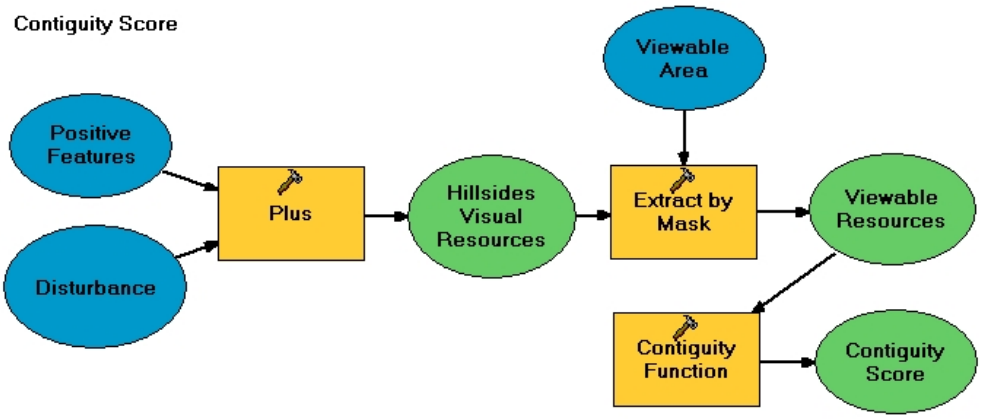
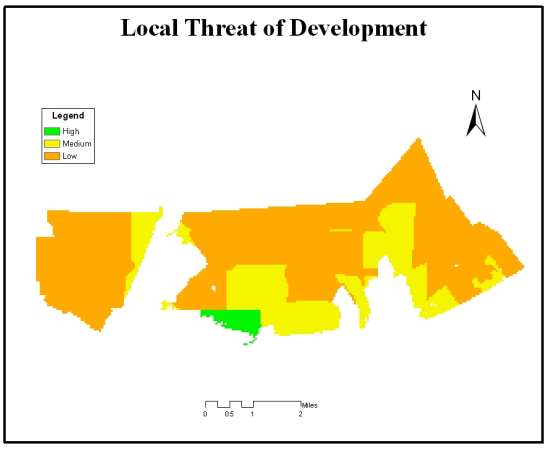


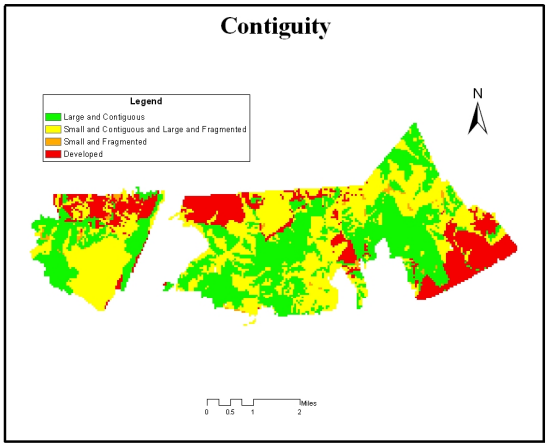
Figure 11. Contiguity model designed for the Quality of Visual Resources analysis.

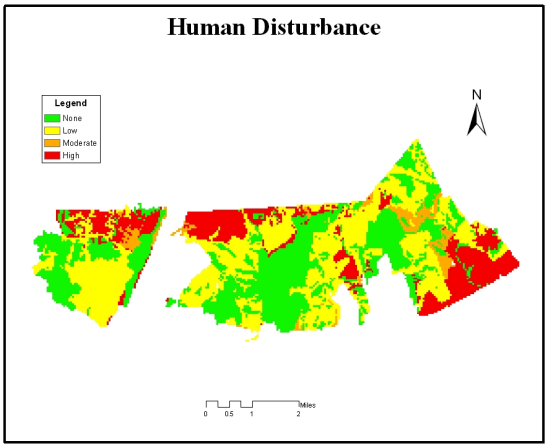
4. Results

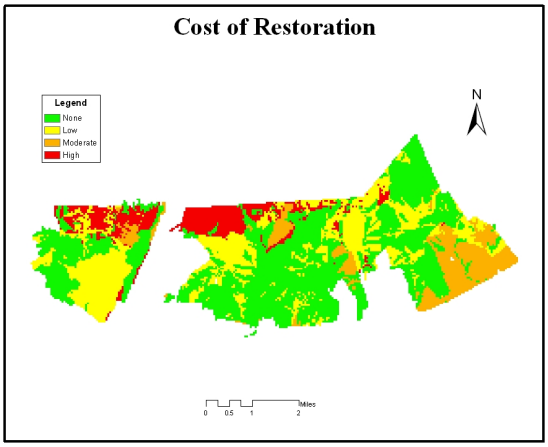
4.1. Native Plant, Wildlife, and Habitat Classification

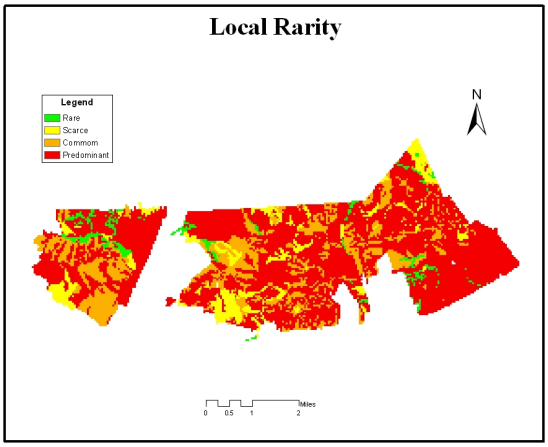
To create an overall score for the Habitat map we first created grids to represent the eight criteria (Figure 12.). The criteria scores were recorded within the Habitat Map attribute table and extracted to create the various grids. Each grid shows the scores which range from 1 to 4 (red to green) and relate to the quality of habitat depending on the specific criteria. We found that once the grids were combined, the highest scoring habitats (scores of 4 and 3 designate higher quality) mainly occurred along the frontal slopes, adjacent to the city limits, and along the west side of the Ventura River (Figure 13). Areas H1, H2, and H3 show the land in the Priority Acquisition Area, which scores the highest for habitat resources. All are located within view of Ventura City. Area H2 is adjacent to current development and is the backdrop for the main part of the city. Area H3 encompasses an existing city park. Acquisition of property within area H3 would be sensible, because it would extend publicly accessible land from the park, while preserving high quality habitat at the same time. Area H1 is highly visible from the freeway and coastline, while also providing some of the best quality habitat in the hillsides, especially due to the fact that part of this area lies along the banks of the Ventura River.

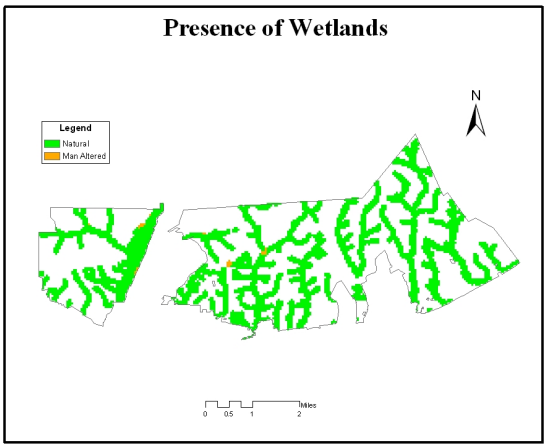

Local Threat of Development
Legend
High
Medium
Low
N
0 0.5 1 2
Miles


Contiguity
Legend
Large and Contiguous
Small and Contiguous and Large and Fragmented
Small and Fragmented
Developed
N
0 0.5 1 2
Miles


Human Disturbance
Legend
None
Low
Moderate
High
N
0 0.5 1 2
Miles


Cost of Restoration
Legend
None
Low
Moderate
High
N
0 0.5 1 2
Miles


Local Rarity
Legend
Rare
Scarce
Commom
Predominant
N
0 0.5 1 2
Miles


Presence of Wetlands
Legend
Natural
Man Altered
N
0 0.5 1 2
Miles

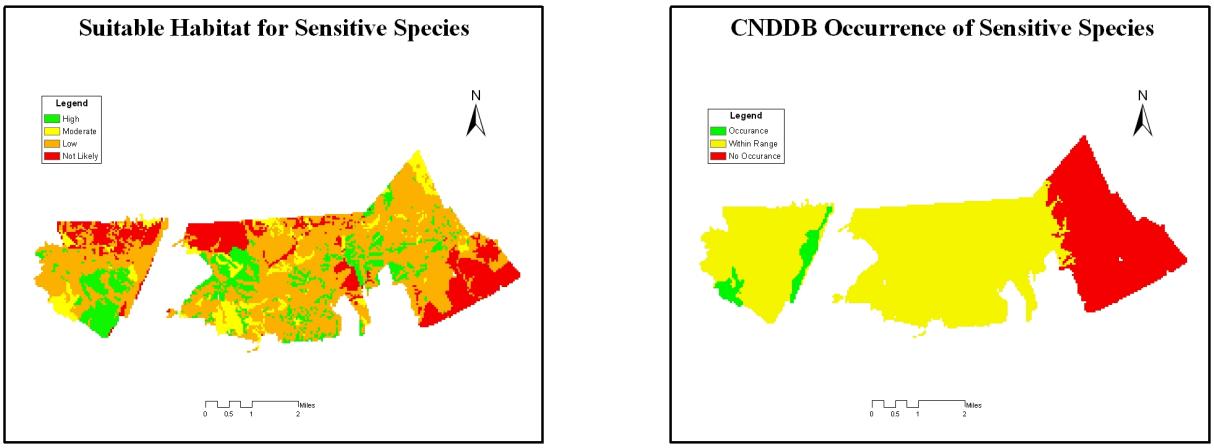


Figure 12. Native Plant, Wildlife, and Habitat Classification criterion grids.

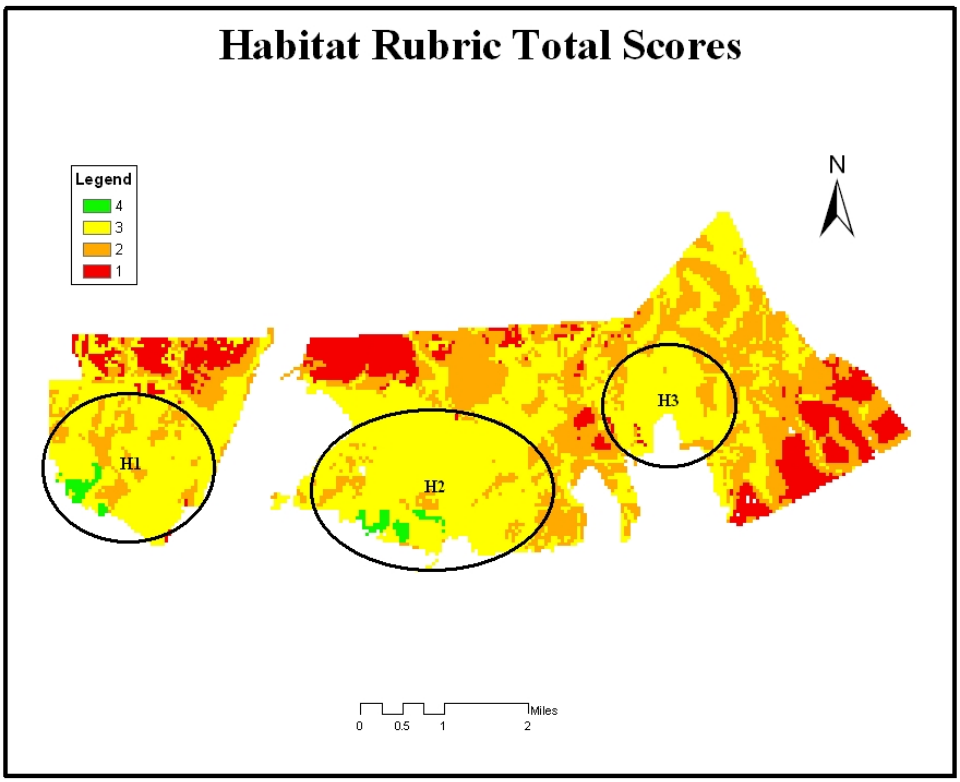
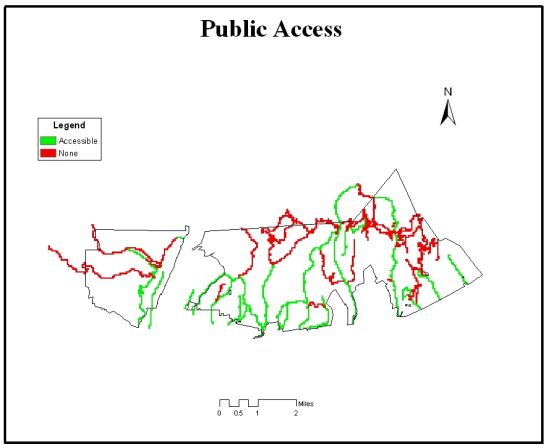


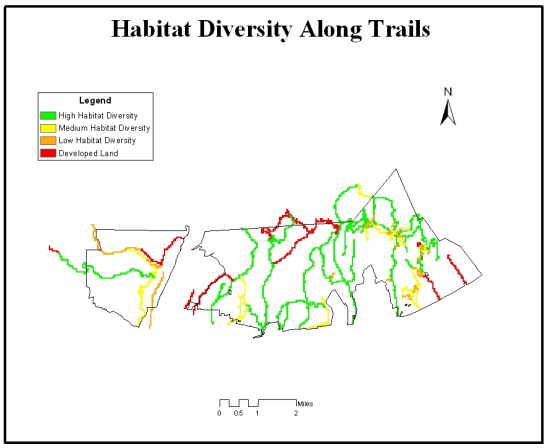
Figure 13. Native Plant, Wildlife, and Habitat classification combined Rubric scores.

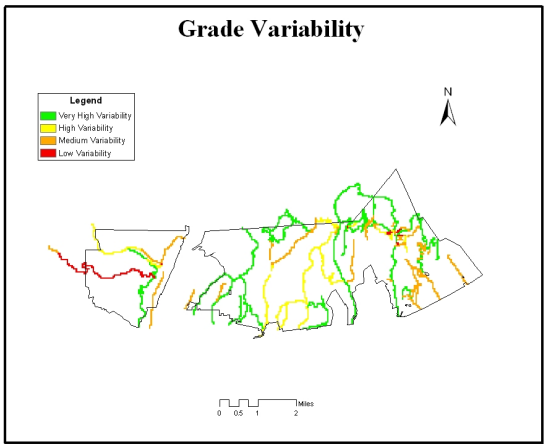
4.2. Public Access and Recreation Classification

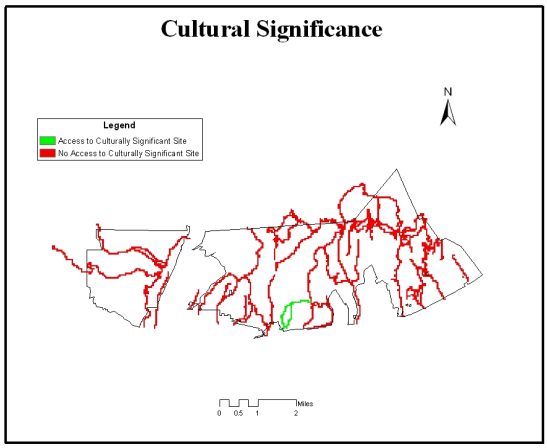
The results of our trail evaluation within the hillsides are shown for each of the six criteria, in Figure 14, and for the total trail scores, in Figure 15. Trails with high scores, designating high public access and recreation potential, are shown in green.

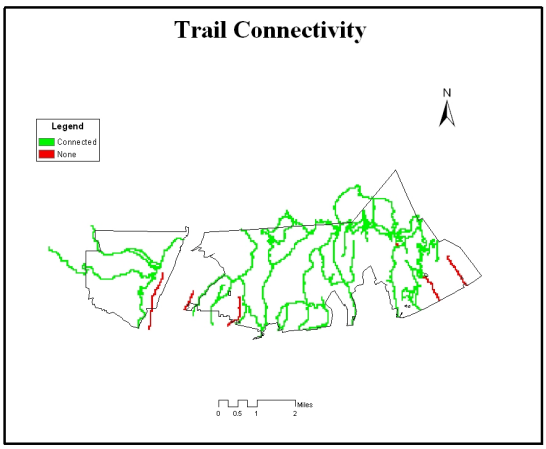
The trails with the highest total scores occur within areas circled in Figure 15 as PAR1, PAR2, and PAR3. PAR1 and PAR2 are situated toward the front of the VHC's Priority Acquisition Area (PAA), while PAR3 is located toward the back of the PAA. The occurrence of higher scoring trails toward the front of the PAA, in PAR1 and PAR2, can be attributed to the high public access scores that these trails received since they connect to roads within Ventura neighborhoods. In addition, these trails received high scores for scenic quality since views are generally not degraded by industrial activities, such as oil operations which are concentrated toward the rear of the PAA. For this same reason, trails toward the front of the PAA, again in PAR1 and PAR2, also received high scores for habitat diversity since the frontal hills are not experiencing a high level of development activity in the form of oil operations. The area designated as PAR3, located toward the eastern side of the PAA, is the only area where trails in the back of the PAA received high scores for public access and recreation potential. Trails within this area received high scores for grade variability, in addition to habitat diversity, scenic quality, and public access (one trail received a high public access score since it originates from a road within a neighborhood).











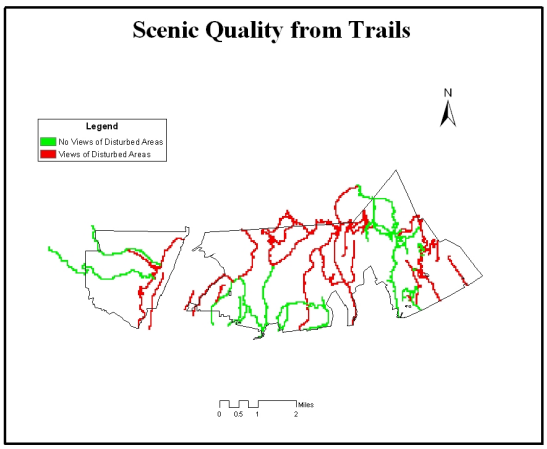


Figure 14. Public Access and Recreation classification criteria grids.

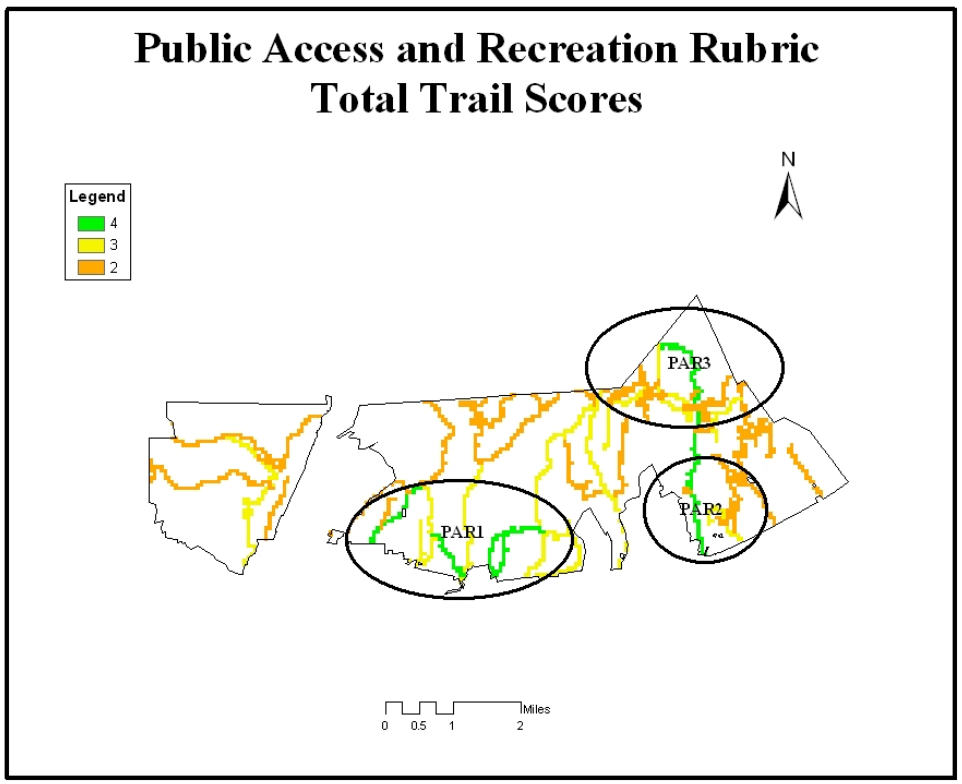
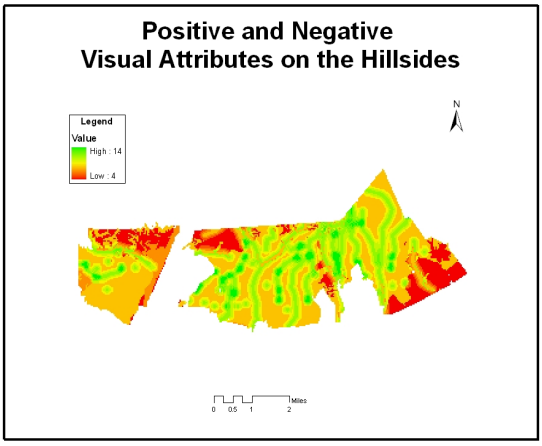


Figure 15. Total trail scores for Public Access and Recreation Rubric.

4.3. Visual Resource Classification

Our visual resource analysis produced results that can be easily interpreted; the value of the visual resources of the hillsides fade from green to red for areas of high to low value, respectively. Figure 16 provides the criterion scores for positive and negative visual attributes in the hillsides and view quantity. Figure 17 provides the total visual resources results with the areas scoring the highest designated with circles labeled V1, V2, and V3. All of these areas occur in the frontal hills of Ventura. These areas scored highly due to their uninterrupted visibility, and their relatively natural condition. Higher scores in areas V1 and V2 can be attributed to the named peaks and obvious ridges within those areas. In addition, V2 contains the culturally significant site "Two Trees", which contributed to the high score. The high score of area V3 can be attributed to the large quantity of viewable area within V3 and its continuous positive visual attributes. Overall, the most critical parameter in this analysis was the view quantity, which effectively masked the hillsides from areas that could not be seen from the viewpoints. The masking effect is directly responsible for the discrepancy between the final visual resources result and the pre-masked positive & negative visual resources map.



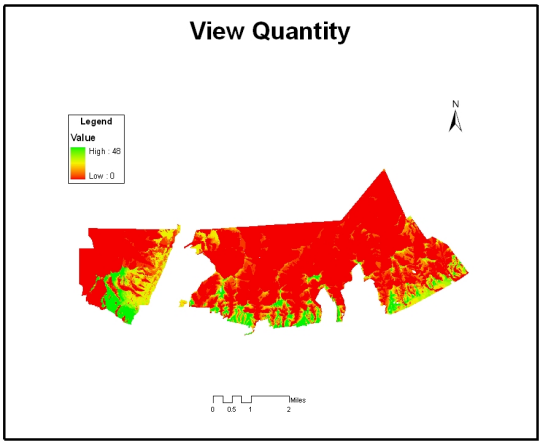


Figure 16. Visual Resource classification criterion layers.

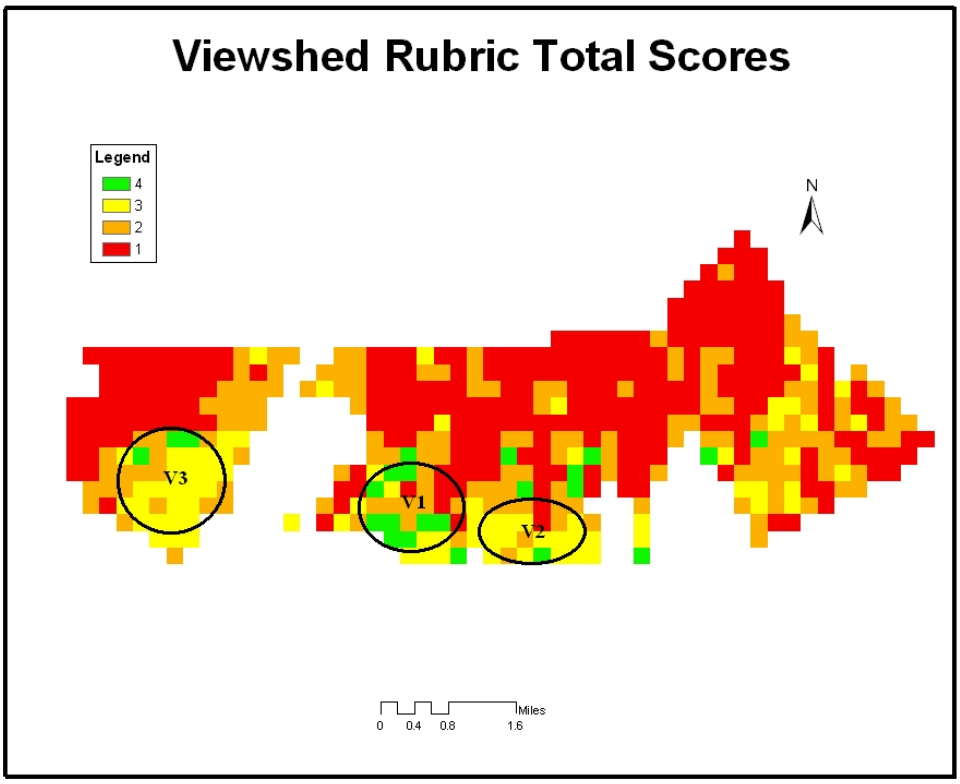


Figure 17. Viewshed Rubric final score.

4.4. Combined Classification

The combination of the public access and recreation; native plant, wildlife, and habitat; and visual resources Rubrics can be seen in Figure 18. These results indicate three areas of resource concentration in the PAA. Much of the hillsides adjacent to and directly north of the City of Ventura have a very high combined resource value, and circles C2 and C3 outline these areas. The Venturan landmark "Two Trees" is located within C3 and is partly responsible for that area's high resource value. Additionally, areas in the western portion of the PAA (circle C1) scored well due to the portion's high visibility and above average habitat quality.

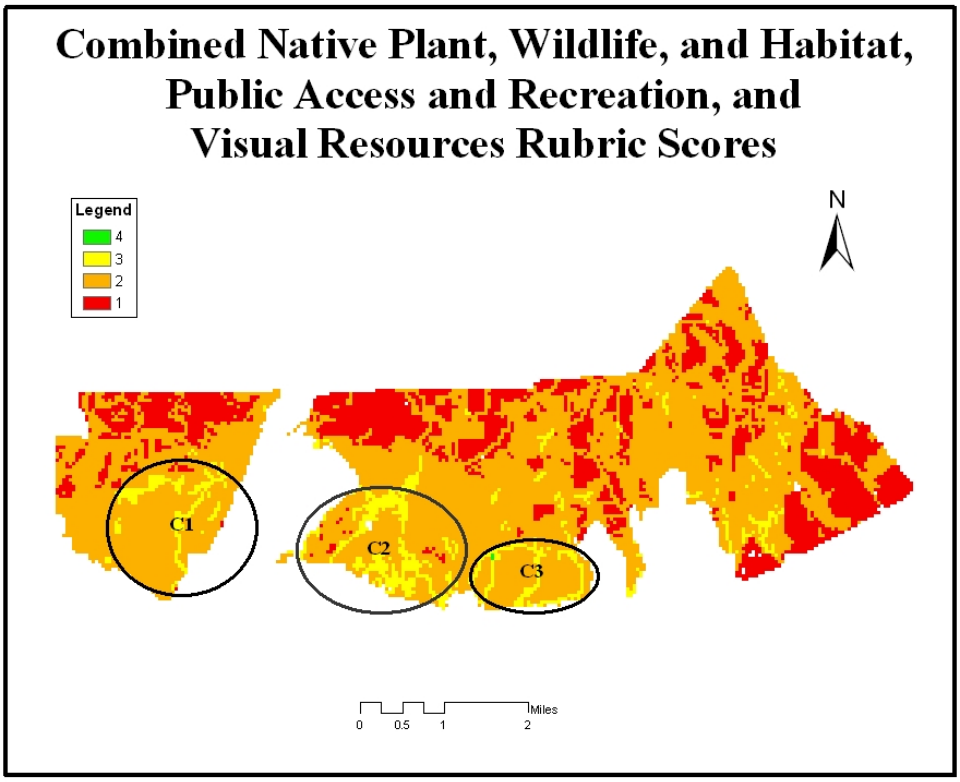


Figure 18. Score of Combined Rubrics

4.5. Parcel Classification

The result of the parcel classification, using the average score method, is provided in Figure 19. Parcels that were classified into the top 33 percent are shown in green, the middle 33 percent are shown in yellow, and the bottom 33 percent are shown in red. Parcels that were classified into the top 33 percent are primarily located in the frontal hills, while parcels that were classified into the bottom 33 percent are primarily located in areas that contain oil exploration and development or agricultural resources.

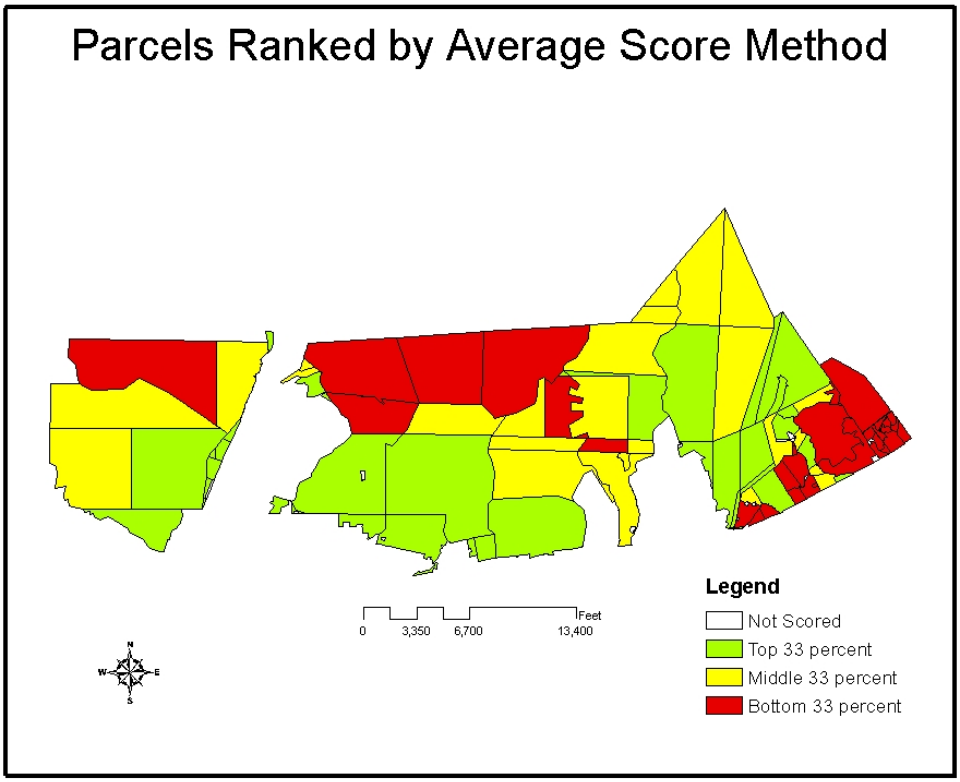


Figure 19. Parcel ranking via the average method. Those parcels that are not scored are small parcels owned by the city or county for public services.

The average score method and added weight score method provided nearly identical results; therefore we chose to report only the average score results. Squaring the scores to add weight to high scoring acres in the averaging process did not result in an outcome different from the average method results with no weight added. The average method results allow the VHC to easily view the parcels where the top, middle, and bottom ranked resources are located. However, to be sure, that averaging has not hidden small areas of very high quality resources; we recommend that the VHC also compare these average results (Table 4) with the maximum and minimum results shown in Tables 5 and 6. For instance, Parcel number 20 ranks in the middle 33% of parcel scores (Table 4), but when comparing this rank to the maximum score within its boundary (Table 5), we find that this same parcel has a score of 4 within its boundary. This score of 4 just happens to represent the locally culturally significant "Two Trees" on the top of the hills. Without also consulting the list of maximum scores within parcels, the VHC may have overlooked this parcel, since it is ranked in the middle 33% of parcel scores.

Table 4. Object IDs of parcels ranked in the top, middle, and bottom 33%, based on the average method.

Average Method Results	
Rank	Object ID in ArcMap
Top 33 %	1, 2, 3, 7, 9, 10, 11, 12, 14, 15, 19, 21, 22, 23, 30, 32, 34, 37, 39, 40, 44, 46, 54, 68, 70, 74, 75, 78, 82, 87, 89, 102, 105, 109, 110, 111
Middle 33%	5, 6, 8, 17, **20**, 24, 25, 26, 27, 33, 35, 36, 38, 58, 69, 71, 81, 83, 88, 96, 97, 98, 104, 107, 112
Bottom 33%	4, 28, 29, 31, 41, 42, 43, 45, 47, 49, 50, 52, 57, 60, 61, 63, 64, 66, 67, 73, 76, 77, 84, 85, 86, 90, 91, 92, 93, 95, 99, 113, 114, 115, 116

Table 5. Object IDs of parcels which include a maximum acre score of 4, 3, 2, or 1

Maximum Score within Parcels	
Maximum Score	Object ID in ArcMap
4	2, 19, **20**, 22, 23, 87, 89, 110
3	1, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 17, 21, 24, 25, 29, 31, 32, 33, 34, 35, 36, 38, 39, 40, 41, 42, 44, 45, 46, 57, 67, 68, 74, 75, 76, 81, 82, 88, 102, 104, 111, 112
2	3, 26, 27, 28, 30, 37, 43, 49, 52, 54, 58, 60, 66, 69, 70, 71, 78, 83, 84, 85, 86, 90, 95, 96, 97, 98, 99, 105, 107, 109, 113, 116
1	47, 50, 61, 63, 64, 73, 77, 91, 92, 93, 114, 115

Table 6. Object IDs of parcels which include a minimum acre score of 3, 2, or 1

Minimum Score within Parcels	
Minimum Score	Object ID in ArcMap
3	23
2	1, 3, 7, 9, 10, 12, 14, 15, 21, 22, 30, 32, 37, 46, 54, 68, 70, 74, 78, 102, 105, 109, 116
1	2, 4, 5, 6, 8, 11, 17, 19, **20**, 24, 25, 26, 27, 28, 29, 31, 33, 34, 35, 36, 38, 39, 40, 41, 42, 43, 44, 45, 47, 49, 50, 52, 57, 58, 60, 61, 63, 64, 66, 67, 69, 71, 73, 75, 76, 77, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 95, 96, 97, 98, 99, 104, 107, 110, 111, 112, 113, 114, 115

4.6. Portfolio Analysis

For the Portfolio Analysis, we selected groups of parcels that provide habitat connectivity, trail connectivity, and viewshed connectivity. In the results that follow, individual parcels are designated by a Parcel ID that is the same as the parcel's Object ID within the GIS. A Portfolio ID was assigned to each portfolio. Suggested portfolios are designated as those parcels with dark blue boundaries. We selected these portfolios by viewing the scoring

results for each rubric on the one-acre raster level and determining which parcels would connect the high-scoring rasters.

Habitat Connectivity

Table 7 provides groups of parcels that connect high quality habitat. The parcels were selected by locating high scoring rasters for habitat and determining which parcels would maximize the connectivity of high scoring rasters. Figure 20 displays the location of these portfolios which lie within the dark blue boundaries.

Table 7. Recommendation for portfolios that maximize habitat connectivity.

Portfolio ID	Parcel IDs
HC1	6, 7, 8, 15
HC2	1, 2, 22, 23, 86, 87, 88, 89
HC3	24, 25, 26, 35, 39, 46, 82, 102, 110

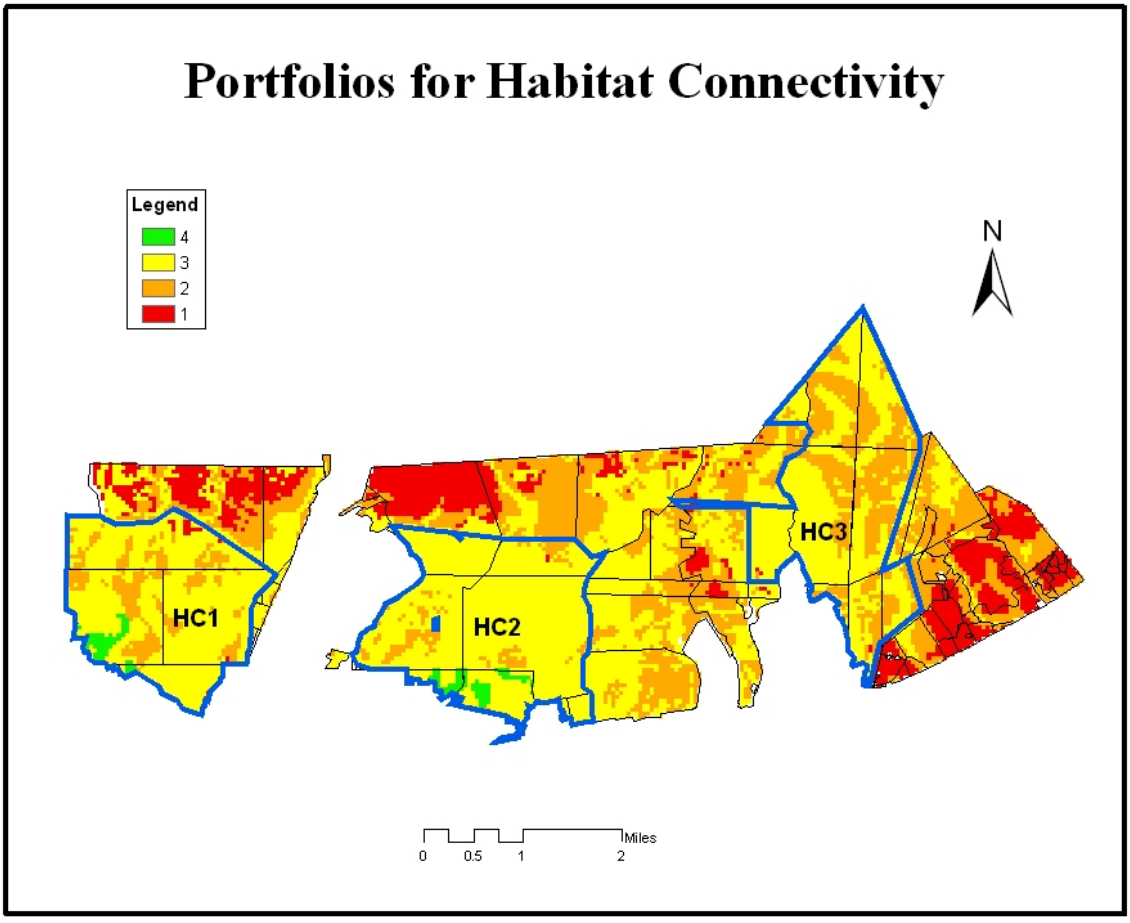


Figure 20. Portfolios that maximize habitat connectivity (designated by dark blue boundaries).

Trail Connectivity

Table 8 provides groups of parcels that connect high quality trails. The parcels were selected by locating high scoring trails and determining which parcels maximize the continuity of these trails. Portfolio TC1 is comprised of parcels that provide continuity for trails leading to Two Trees. Figure 21 shows the location of the portfolios which lie within the dark blue boundaries.

Table 8. Recommendation for portfolios that maximize trail connectivity.

Portfolio ID	Parcel IDs
TC1	2, 19, 20, 22, 23, 87, 89
TC2	24, 25, 35, 110

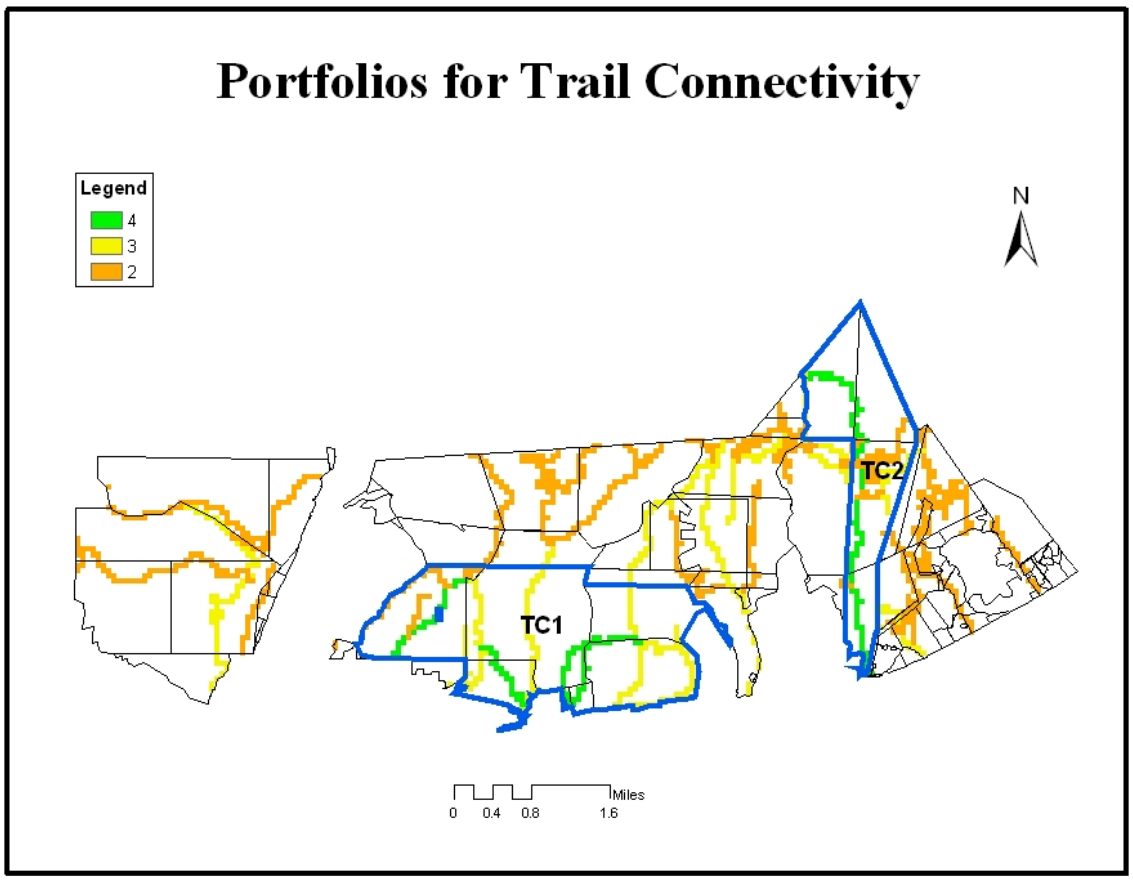


Figure 21. Portfolios that maximize trail connectivity (designated by dark blue boundaries).

Visual Connectivity

Table 9 provides groups of parcels that connect high quality viewsheds. The parcels were selected by locating high scoring rasters for visual resources and determining which parcels connect high scoring rasters. The focus for viewshed connectivity was the frontal slopes. Figure 22 shows the location of portfolios which lie with the dark blue boundaries.

Table 9. Recommendation for portfolios that maximize viewshed connectivity.

Portfolio ID	Parcel IDs
VC1	7, 8, 15
VC2	1, 2, 87
VC3	19, 22, 23

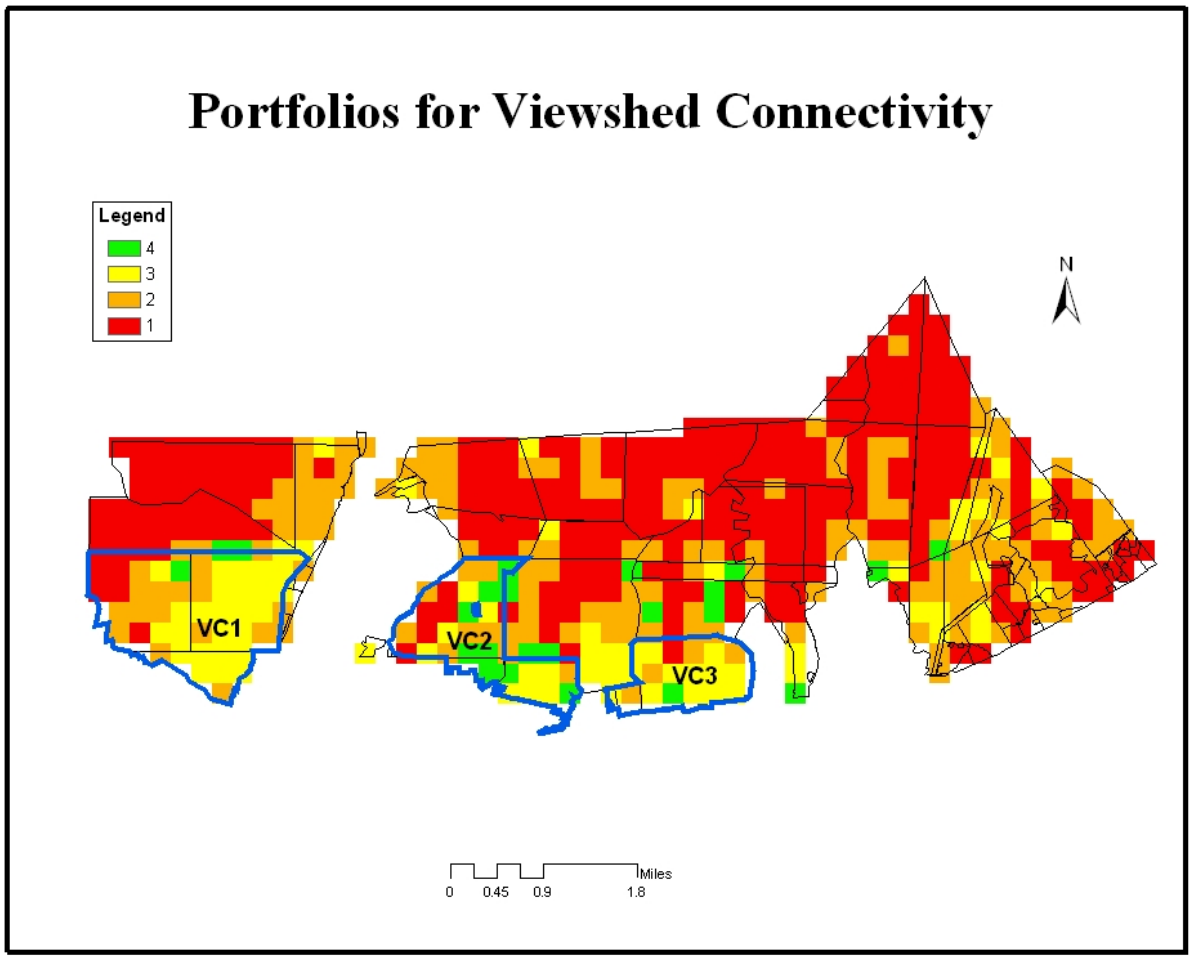


Figure 22. Portfolios that maximize viewshed connectivity (designated by dark blue boundaries).

5. Recommendations

5.1. Model Use

The purpose of our planning support model is to objectively compare multiple parcels. In our analysis we weighted each criterion and each Rubric equally by averaging results across rubrics. Rather than weight all criteria equally, the VHC may want to assign different weights to reflect their conservation goals. We designed the model with the ability to adapt to differing preferences. Different weights can be assigned within the model at both the criteria and the Rubric level. Examples would be to put a stronger importance on the criterion *local rarity of habitat types* within the habitat Rubric or to place greater importance on biological resources in general. See Figure 23 below for a screenshot of the model in the Rubric weighting phase. A full step by step tutorial on model use, complete with examples, was provided to the VHC to ensure that they are confident and familiar with the model.

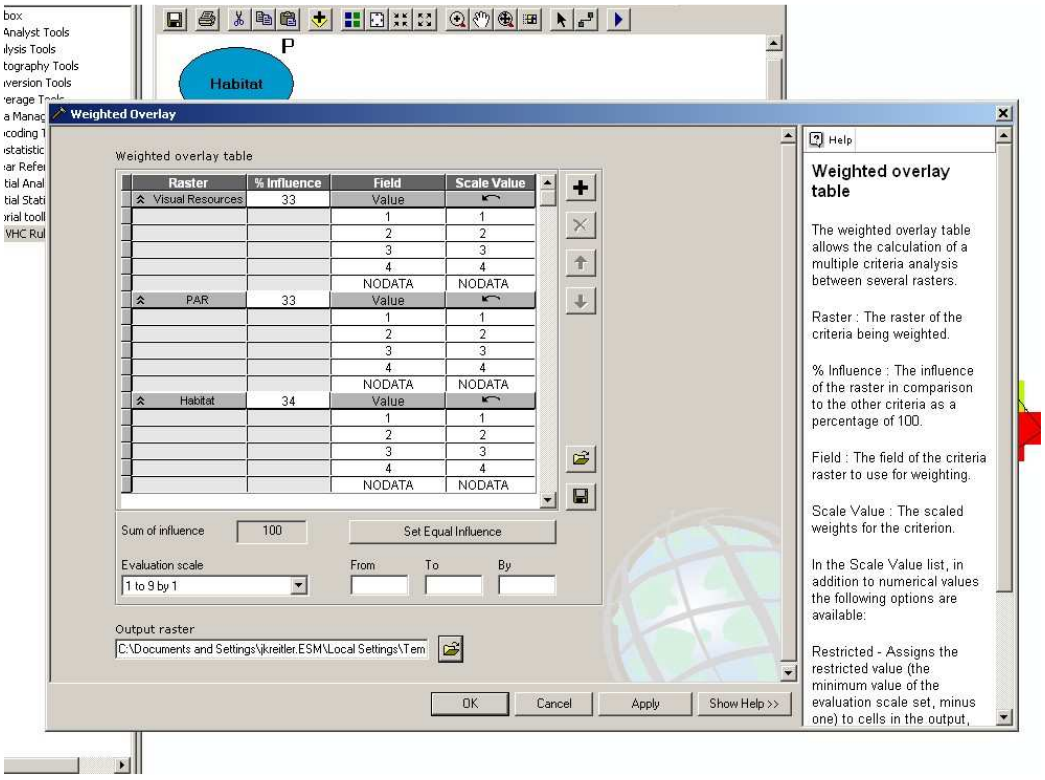


Figure 23. Screenshot of the weighting process in the model

5.2. On-Site Evaluation

The most effective means of assessing the resources on the land is to perform an on-site evaluation; however, due to the private ownership of the parcels, we did not have access to any of the parcels to perform on-site evaluations. Instead, aerial photography and the use of other pertinent GIS' were used. The VHC should therefore perform an on-site evaluation on potential parcels as they become available for consideration. By doing so, the VHC will be able to cross-check the accuracy of our findings, examine resources that are not visible through aerial photography, identify changes that may have occurred since the GIS was compiled, and perform a comprehensive evaluation pursuant to the Checklist.

GIS and on-site evaluation are complementary tools in that both allow the VHC to observe what they would not normally see by relying solely on one or the other. The comprehensive database should not be considered as a substitute for on-site evaluations; rather, our database should be supplemented with an on-the-ground inspection of resources.

Many biotic communities are difficult to identify without a specialist performing an evaluation. If habitat quality is the focus of a certain acquisition, a detailed examination of the nature and the condition of sensitive areas should be performed. The time of year that the examination is performed should also be considered since seasonal changes may inhibit or enhance the production of various ecosystems.

In addition to performing a site-specific assessment, the VHC should be aware of potential landscape dynamics that may have altered the area Landslides, floods, fires, and human development are activities that not only have the potential to alter the health of landscapes, but also change recreational values and viewsheds. If any such event should occur, the VHC should re-evaluate the area with updated GIS and aerial photography.

The effects of certain dynamics such as hazardous waste problems or the effects from adjacent land use may not be evident from aerial photography. Therefore, having a professional examine the property with these issues in mind is critical. Oil extraction and ranching are two prevalent activities that take place in the hillsides. Evidence of degradation caused by these activities can be verified through a comprehensive on-site evaluation to determine what type of restoration effort is required.

5.3. Trail Construction and Enhancement

Once the VHC has acquired a parcel, it may be necessary for them to enhance existing trails or to construct new trails. Since we did not have access to the hillsides, it is possible that rugged terrain or other physical obstacles were not detected and will require trail enhancement. In addition to addressing unforeseen circumstances with trails, the VHC may wish to construct new trails to improve public access and recreational opportunities once they have acquired a parcel.

After consultation with the Santa Monica Mountains Conservancy, we received the following recommendations regarding trail enhancement and construction that would be helpful to the VHC once they have acquired a parcel (Rorie Skei, personal communication, October 2004).

1. Solicit Input from Various Stakeholders: After parcel acquisition, the VHC would benefit from holding a public forum and inviting members of the City Council, trail organizations, Sierra Club, and other pertinent stakeholders. Together with their experience, they can come to a consensus on the various possibilities for trail enhancement and construction in the hillsides.
2. Develop an Understanding of State Laws: VHC would benefit from being familiar with state laws in the event that trail construction triggers the requirements of the California Environmental Quality Act (CEQA). The CEQA process requires California's public agencies to identify significant environmental impacts of their actions and to avoid or mitigate those impacts, where feasible. If a public agency provides funding to the VHC for acquisition or restoration, the VHC will be required to follow the CEQA process if trail construction has the potential to cause environmental effects.

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7. Appendices

7.1. VHC Acquisition Strategy Document (Excerpt)

Acquisition Eligibility Standards and Selection Criteria

A. Eligibility Standards

1. All properties or conservation easements acquired or funded by VHC shall be obtained from a willing seller or donor.

2. All properties or conservation easements acquired or funded by VHC shall include one or more of the following:
    a. Potential public access or recreation value;
    b. Native plant or wildlife value, native habitat or the potential for the restoration of native habitat; or,
    c. Scenic resources such as ridgelines and view sheds.

B. Selection Criteria

All proposed acquisitions shall be evaluated using the following criteria. The criteria are not ranked in order of importance.

1. The property has a high likelihood of being converted to urban development, rural residential development, or other non-open space or non-parkland uses.
2. The property is proximate to or contiguous with existing protected parcels.
3. The acquisition has significant strategic value in meeting broad VHC goals of providing public access or recreation, protecting native habitat or preserving scenic views.
4. There is a high level of public interest in preservation of the property.
5. The property includes a unique scenic or natural feature.
6. The acquisition contributes to the protection of scenic views.
7. The acquisition provides a vista point for a significant scenic feature such as the Channel Islands or Topa Topa Mountains.
8. The property provides multiple benefits (e.g., a trail connection and preservation of a wildlife corridor).
9. The acquisition presents the opportunity for significant passive recreation opportunities or has high interpretive education value.
10. The acquisition provides or potentially may provide public access for passive recreation.

11. The acquisition includes or potentially includes an important trailhead, a regional or local trail or trail connection.
12. The acquisition provides suitable habitat for or supports local-, state- or federally-listed rare, threatened or endangered plant or animal species.
13. The acquisition provides local-, state- or federally-recognized sensitive habitat types or opportunity for restoration or enhancement of such habitat types.
14. The property provides important water quality or other watershed benefits or protection.
15. The acquisition contains a perennial, intermittent or ephemeral drainage, wetland or other water body.
16. The acquisition includes a federal, state, or locally-designated historic or archeologically significant site or a site eligible for such designation.
17. The acquisition presents a unique time-limited opportunity at the time of purchase.
18. The acquisition is eligible for and can be assisted by matching or mitigation funds from government and/or non-governmental organizations.

7.2. Habitat Map Methodology

Digital imagery is a useful tool that complements other vector GIS data. The main objective for creating the vegetation map of the hillsides is to ascertain a habitat score for each individual parcel in conjunction with other accumulated data to generate a total parcel score. The aerial photos as backdrops helped to illustrate the vegetation series on the hillsides and emphasized the spatial relationships between the different vegetation cover types.

We constructed the habitat map using heads-up digitizing. Isoclustering was not applied in this analysis because is it considered less accurate. Furthermore, heads-up digitizing is considered, among specialists, as the most straightforward method to generate vectors using aerial photographs.

Each series type was separated from one another by drawing polygons around their approximate ranges. We were able to do this using the ESRI ArcMap version 9.0 program. The polygons were drawn on a separate layer overlaying the hillside aerial photographs using a mouse.

In deciding where the polygons were to be drawn, they had to include a certain percentage of the vegetation or bare ground cover. If at least 75 percent of the polygon cover consisted of a specific series type then it was designated that series type. For instance, if the ground cover had a form of development (oil derricks or agriculture) for at least 75 percent of the polygon area it was classified as developed.

In visual interpretation and mapping, there is a tradeoff between mapping accuracy and processing speed. Therefore, usually a minimal area is defined as the smallest unit to be

mapped by the interpreter. The table below lists the smallest acreages delineated for each series types.

Minimal area for each vegetation series.

Series	Acres
Coast live oak series, woodland	0.6
Coast live oak series, savanna	1.6
California sagebrush series	0.7
Purple sagebrush series	0.5
Coyote brush series	0.3
California annual grassland series	0.2
Sumac series	0.8
Mulefat series	0.3
Developed	0.1
Impossible to differentiate	4.7

A number of influences affect vegetation variation that need to be considered during the interpretation process. These are the patterns and processes within the landscape, which are caused by an intricate combination of biophysical properties, disturbance patterns, and populations and community characteristics.

The creation of the Habitat map strongly depends on the interpreter knowledge of the area, and her/his decision-making processes. Factors such as the location of vegetation transitory boundaries, extent of disturbances, and types of vegetation could be interpreted differently. As a result, no two interpreters will likely generate the same Habitat map. In order to reduce uncertainty, ground-truthing was performed at various sites around the Priority Acquisition Area to ensure series classification was accurate. In addition, to increase map precision practice maps were drawn and compared to the actual vegetation on the hillside.

Our ability to interpret ground cover in the aerial photographs can be inhibited by the quality of the photographs. Therefore, it was possible to incorrectly interpret features that are somewhat obscured due to a number of factors, such as shadows, contrast, brightness, and blurring.

It is difficult to obtain aerial photographs that do not have shadows of buildings, cliffs, or tall vegetation. If the images were taken when the sun's angle was greater than 30 degrees, then the shadow effects could be minimized. Unfortunately, we did not have the necessary information on our photographs to determine what time of day they were taken. Shadows of elevated features, such as trees, are an aesthetic concern in aerial photography. If a building or tree is located at the exact center, radial displacement causes it to lean away from center.

Aerial photograph contrast and brightness was altered when it was necessary to make out certain ground features. This was done by adjusting the computer monitor to the desired results. However, increasing the brightness for some ground surfaces was limited by its high reflectivity.

The last inhibiting aspects in the aerial photographs were blurring and particle deposits. Blurring in a small subset of aerial quads made it difficult to determine the type and extent of ground cover. Particles such as dust and lint were limited and did not inhibit our photo interpretation of ground cover types.

The procedure used to generate the Habitat map was labor intensive and required rigorous editing. The common errors generated in heads-up digitizing are overshooting and undershooting digitized lines, dangling arcs and nodes, unclosed polygons, slivers (boundaries of adjacent polygons overlap), gaps (boundaries of polygons that supposedly share a common border do not touch due to "double digitizing"), and attribute data being entered incorrectly. In addition, limited access to the property reduced confidence in assigning vegetation type to each polygon.

Wetlands Map

In close association with the Habitat map is the NWI and CSUN classified Wetlands layer. In 1974, the USFWS created the National Wetlands classification to increase the availability of information on the location, extent, and types of wetlands and deepwater habitats. The USFWS defines wetlands as, "lands transitional between terrestrial and aquatic Systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification wetlands must have one or more of the following three attributes: 1) at least periodically, the land supports predominantly hydrophytes; 2) the substrate is predominantly undrained hydric soil; and 3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of the year."

The wetlands habitats are classified into a hierarchy starting with Systems, Subsystems, Classes, and Subclasses. The two main Systems present on the hillsides are the Riverine and Palustrine Systems. The Riverine System has four Subsystems (Tidal, Lower Perennial, Upper Perennial, and Intermittent), while the Palustrine has no Subsystems. Within the Subsystems, there are Classes based on the substrate material, flooding regime, and plant associations. One of these classes enabled us to determine if the wetland has been altered by human activities such as diked or excavated.

Palustrine wetlands may occur near a Riverine System. Refer to the schematic diagram below depicting the close association that may occur between the two Systems.

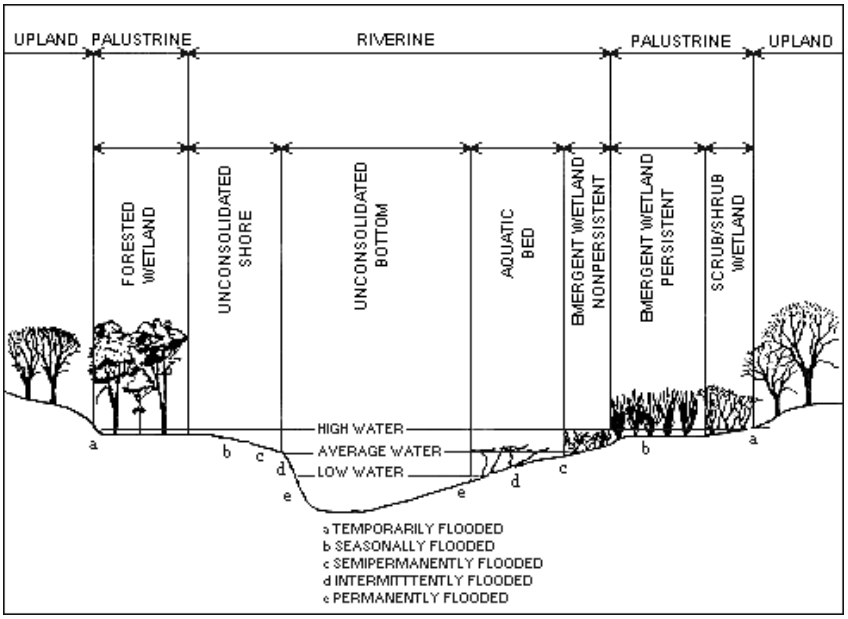


Diagram showing the typical locations of Palustrine and Riverine Systems (U.S. Fish and Wildlife Service, 2004).

Ground-truthing surveys taken along the PAA boundary

Site: 1	
GPS:	North 34/17.468 West 119/11.865
Location Information:	School/Church parking lot next to watershed
Aspect:	N/NW
Vegetation Series:	California sagebrush series
Vegetation Associations:	(1) Elderberry, (2) coyote brush, (3) mule fat, (4) tobacco tree
Notes:	From parking lot: Riparian area below 30' wide banks, 25' deep. Flat area where mule fat dominates above creek banks.
Site: 2	
GPS:	North 34/18.013 West 119/12.192
Location Information:	WestRidge Dr. 1200 - Dead end turn around
Aspect:	S
Vegetation Series:	Coast live oak series
Vegetation Associations:	(1) Sage brush, (2) purple sage, (3) chollo cactus, (4) poison oak
Notes:	Looking down from roadside overlook, we see oaks in riparian area up gulley and south facing. Chollo cactus is on NW facing hill with sagebrush.
Site: 3	
GPS:	North 34/18.251 West 119/12.630
Location Information:	South view circle, via arroyo corner
Aspect:	
Vegetation Series:	California sagebrush series
Vegetation Associations:	California sunflower
Notes:	Grazing ontop of hillside. Fence present with the sunflower in the disturbed area. If area was undisturbed then artemesia would progress over the top of the hill

7.3. Scoring Methodology: Native Plants, Wildlife, and Habitat

I. Habitat Sensitivity and Species Sensitivity

Local Rarity

4 Coast live oak, woodland and savanna
3 Mulefat, sumac, coyote brush
2 California annual grassland
1 Purple sagebrush, California sagebrush, Impossible to Differentiate

Presence of wetlands

4 Natural wetland
2 Man-made wetland
1 No wetland

Suitable habitat for sensitive species

4 Supports a high number of sensitive species (California annual grassland)
3 Supports a moderate number of sensitive species (sumac and mulefat)
2 Supports a low number of sensitive species (coast live oak woodland and savanna, California sagebrush, purple sagebrush, coyote brush, and Impossible to Differentiate)
1 Does not likely support sensitive species (Developed)

CNDDB occurrence of sensitive species

4 Occurrence record
2 Within range of point occurrence
1 No occurrence record

Local threat of development

4 High – Within city boundary
3 Medium – Adjacent to development
2 Low – Not adjacent to development or some protection by Williamson Act
1 None – Already protected by easement

II. Habitat Quality

Contiguity

4 Contiguous
1 Fragmented

Human disturbance

4 No disturbance - 0% to 5%
3 Low level of disturbance - 5% to 10%
2 Moderate level of disturbance - 11% to 25%
1 High level of disturbance - 26% to 100%

Restoration

4 No restoration is recommended
3 Low cost restoration is recommended (<$50,000)
2 Moderate cost restoration is recommended ($50,000 - $125,000)
1 High cost restoration is recommended (>$125,000)

Presence of Wildlife Corridors (to be assessed when data is available)

4 A wildlife corridor passes through the property
1 No wildlife corridors pass through the property

7.4. Scoring Methodology: Public Access and Recreation

I. Public Access

4 Trail begins at a road from Ventura neighborhoods or from a local park
1 Trail does not begin at a road or local park

II. Habitat Diversity

4 Trail passes through three or more habitat types, and mostly undeveloped land
3 Trail passes through two habitat types, and mostly undeveloped land
2 Trail passes through one habitat type, and mostly undeveloped land
1 Trail passes through mostly developed land

III. Grade Variability

4 Grade varies three or more times, with a maximum grade of 10%
3 Grade varies two times, with a maximum grade of 10%
2 Grade varies once or not at all, with a maximum grade of 10%
1 Maximum grade is more than 10%

IV. Cultural Significance

4 Trail leads to a culturally significant site, such as Two Trees
1 Trail does not lead to a culturally significant site

V. Trail Connectivity

4 Trail connects to at least one other trail
1 Trail does not connect to at least one other trail

VI. Scenic Quality

4 Trail provides views of disturbed areas (industrial operations)
1 Trail does not provide views of disturbed areas (industrial operations)

7.5. Scoring Methodology: Visual Resources

I. View Quantity

Quantity of view will be measured by the amount of viewable area from viewpoints in and outside the city of Ventura. A 1000m (1km, 100m?) grid will overlay the viewable area grid. If an area is viewed from the viewpoints2 then the quality of that view will be evaluated for the larger overlay grid.

II. Quality of View

Level of Disturbance

4 Natural – No manmade structures present (example: area is nearly pristine as seen from aerial photos and from the viewpoints)
3 Mostly natural – Some anthropogenic disturbance, natural habitat type difficult to distinguish (example: area has been grazed)
2 Moderately disturbed – altered by anthropogenic disturbance, which includes a 500-foot buffer around disturbance point (example: a road crosses the pixel)
1 Disturbed- Manmade structures are present and detract from view (example: oil derricks and platforms)

Presence of Distinguishing Landforms

How many of the following are present: named canyon, ridge, summit, two trees?

4 All are present
3 Two are present
2 At least one is present
1 None are present

Contiguity of Viewshed

Neighboring cells will be evaluated to determine the level of contiguity. For example, a cell will receive a higher score if all of its neighbors (queen's rule, or only horizontal neighbors?) have low disturbance level or other quality that affects the view. See excel example.

4 score of 3-4 in the score matrix
3 score of 2-3 in the score matrix
2 score of 1-2 in the score matrix
1 score of <1 in the score matrix

[2] The viewpoints are a series of observation points used by the computer program to determine what can be seen. These were placed on the 101, Telegraph road, and on hwy 33 at the mouth of the Ventura River.

7.6. Parcel Checklist

The primary purpose of the checklist is to follow the acquisition procedure according to the mission statement of the Ventura Hillsides Conservancy (VHC): "To preserve as natural lands the hillsides, canyons, and open space that contribute to the unique character and natural environment of the City of San Buenaventura and the surrounding region for the benefit of present and future generations."

Additional Purposes:

- To ensure that relevant legal procedures are adhered to
- To take into account salient factors other than the merits identified in a property evaluation
- To flag potential problems and issues that might otherwise be overlooked

The VHC Board of Trustees retains discretion over acquisition or disposition of land and conservation easements and will evaluate each project on its own merits.

Minimum Qualification

To qualify for selection, property should meet all of the following:

☐ The property exists within the VHC's Primary Interest Area.

☐ The property includes one or more of the following: (i) Native plant or wildlife value, native habitat or the potential for the restoration of native habitat; (ii) potential public access or passive recreation value; (iii) scenic resources such as ridgelines and viewsheds.

☐ Past data collection and synthesis is corroborated through appropriate on-site assessment.

☐ The land comprising and adjacent to the property is deemed environmentally safe and/or measures have been taken to eliminate responsibility of potential environmental hazards.

☐ The VHC, the landowner or other parties have identified a viable financial mechanism or plan that is adequate to ensure proper long-term management of the land to be acquired, or adequate monitoring and enforcement of the proposed conservation easement.

Public Benefit

To qualify for selection, a property should meet one or more of these items. Projects meeting multiple items will have a higher priority or will be deemed more beneficial.

☐ The property has a high risk of being developed in the near future.

- ☐ On-site assessments have revealed the presence of endangered, threatened, or sensitive species (federal or state).
- ☐ The property contains a significant cultural or archeological site.
- ☐ Selection would result in significantly increased public awareness and forward momentum (i.e. a first acquisition).
- ☐ Provides a buffer for or is contiguous to an existing conservation easement, park, or other protected/undeveloped land.
- ☐ The property is available and is selling under its appraised value.
- ☐ Selection would contribute to the overall balance in parcel attributes taking into account VHC's existing portfolio of land.

Infeasibility

Factors that may rule out VHC's involvement: A property may be ranked in the top 33 percent of existing parcels and still may not be accepted if one or more of the following apply:

- ☐ There is no threat or likelihood of the property being developed or disturbed in a way that would compromise its conservation values.
- ☐ The property transaction is complex in such a way as to significantly deplete the resources available to VHC or require provisions that would diminish the property's primary values.
- ☐ Ethical or public image problems exist in association with the acceptance of the project.
- ☐ The property is priced significantly higher than its appraised price.
- ☐ Hazards or liabilities on the property are insurmountable.
- ☐ The proposed open space is part of a development agreement that, overall, is likely to have significant adverse impacts.
- ☐ There is no public agency or acceptable organization willing to accept transfer of the property from the VHC, and the VHC does not have the desire or cannot obtain sufficient resources to own and manage the property itself.
- ☐ For conservation easements, the landowner or other project supporters are unwilling or unable to appropriate for long-term monitoring and enforcement of the easement.

7.7. Park Planning Guidelines

(Source: Fogg, *Park Planning Guidelines,* 2000)

General Trail Quality

- Trails are located in areas with good soil conditions (areas that are not wet or erosion-prone)
- Trail allows for a variety of recreational experiences and include a variety of natural features (rock formations, forested areas, open spaces, traversing ridges and valleys, and waterbodies) and a variety of grades
- Maximum sustainable grade does not exceed 10 percent
- Trail benefits multiple users and appropriate uses – hiking, wildlife viewing biking, and equestrian
- Trail is located within 400 feet of a parking area
- Trail is within walking or biking distance from neighborhoods
- Trail is linked to commuter transit system
- Trail does not cross utility lines or has topography/vegetation that keeps utility lines from view
- Trail provides maximum scenic beauty with the absence of negative or non-natural features

Trail Quality for Hiking

- Trail provides day-use opportunities, such as short hikes and nature walks that appeal to all ages (average hike is 4-5 hours)
- Trail includes few road crossings or other potential dangers
- Trail leads to a final destination that has aesthetic or cultural value

Trail Quality for Wildlife Viewing

- Trail follows edges and transition zones (fields/forests, swamps/open water), which are the most productive for wildlife

Trail Quality for Biking

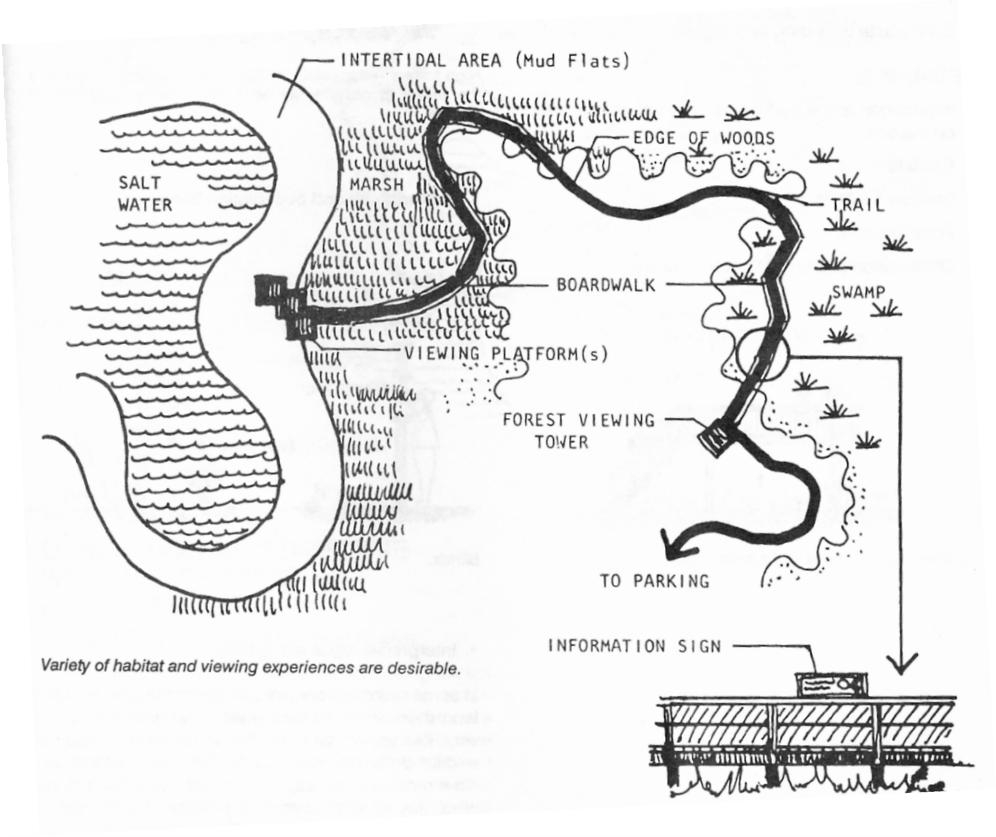
- Trail has a minimum length of three to five miles, with trails 10 to 30 miles desirable

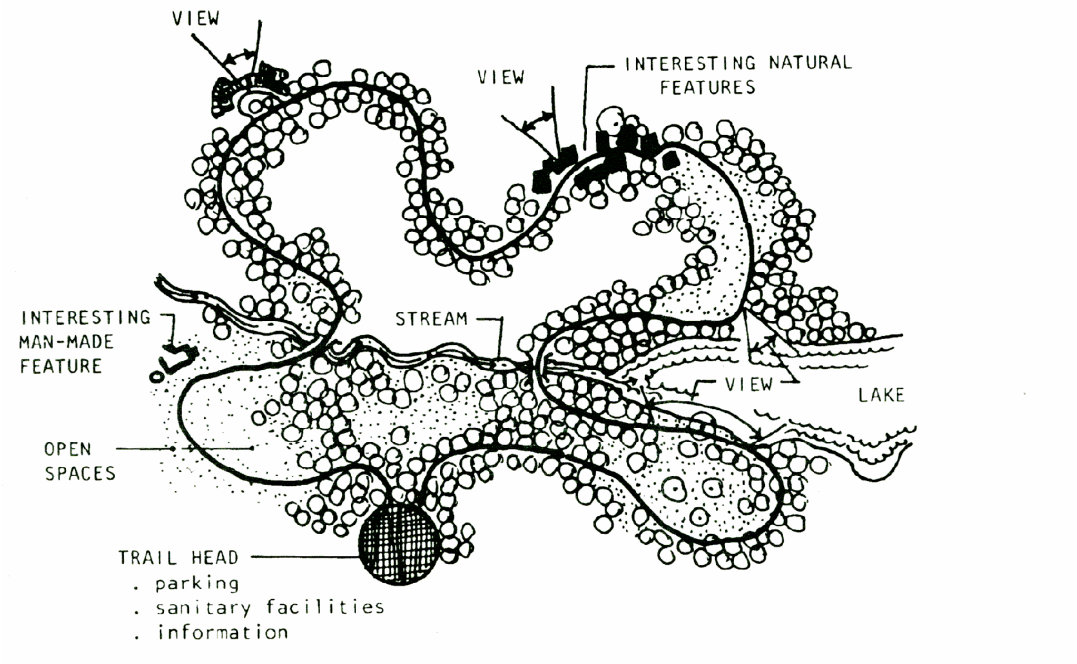
Trail Quality for Equestrian

- Trail includes adequate car/trailer parking facilities at trailheads
- Trail includes short stretches (1/2 mile) of straight alignment for running the horse

7.8. Trail Design Models

(Source: Fogg, *Park Planning Guidelines,* 2000)



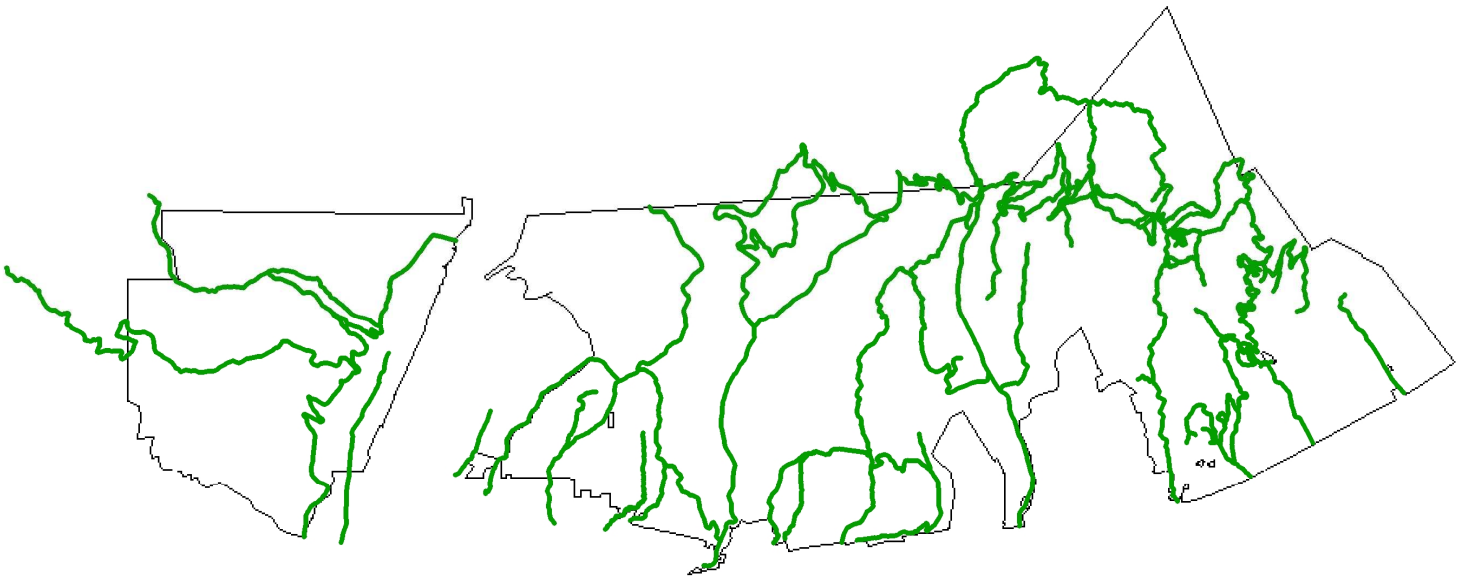


7.9. Open 80 Master Plan: Public Trails Plan

(Source: *Open 80 Master Plan,* Venturans for Open 80, 2002).

(*Note: Trails are designated by orange lines.)*

7.10. Existing Trails in the VHC Priority Acquisition Area



Map Created by Marc Cavallaro